.

بسم الله الرحمن الرحيم

Shendi University

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The Epidemiology of Tuberculosis among Internal Displaced Persons in Alsalam Camp, Nyala South Darfur State - Sudan (2019 – 2021).

A Thesis Submitted in Fulfilment of the Requirement for the Ph.D. in Public Health (Epidemiology)

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October 2022

Dedication

This simple work is Dedicated

to:

Sole of My Father

My mother, My family

Brothers and sisters

Acknowledgment

First and last, thanks to Allah .. I appreciate Shendi University Faculty of Postgraduate Studies and the Faculty of Public Health especially the department of Epidemiology Public Health with all staff.

I would like to thank the supervisor Professor Suleman Elkamil Ahmed, the professor of the Public Health, for the guidance, advice, supervision, and the encouragement during the research period directly and from the distance.

I also express my sincere thanks to the state Ministry of Health - South Darfur Tuberculosis program namely the TB Control Program Coordinator Fatima Mohamed Yousif, to Humanitarian Aid Commission, and to community leaders in Alsalam IDPs camp for their support in this research.

Gratitude thanks to all staff in Alsalam clinic namely Dr. Eissa Mohammed the Health Facility in Charge, Dr. Mohamed Kheer Ibrahim the Medical Lab Specialist, the medical Assistant Fatima, Nurse Sara, the Health Promotor Siham Abuh, and the register Mohamoud Awad, also to Care International WASH Officer Ebtisam Elnagi and all Community Health Volunteers in the camp.

Furthermore, plentiful acknowledgments to the strong team of my colleagues of data collection, camp guiders and the driver for the valuable efforts during the field it was a real field digging in the camp.

Moreover, my thanks to my colleagues Mr. Abdelrahim Elbashir (Atbara), Dr. Ahmed Mohamed Hussien, Dr. Yousif Abdelrahman and other colleagues who supported in this research and for those linked me with the supervisor, library, journals, and the faculty when I far away as well as the revision of the work.

Special thanks to my wife for her time and support me accomplished this work with all her patience day and night during this period with mobility and the homework's.

As a final point, I do not forget to express my precious thankfulness to everyone who participated and gave me a hand in one way or another to make this research in this form.

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List of Abbreviations:

BCG	Bacilli CalmètteGuérin
COVID-19	Corona Virus Disease 2019
DOH	District of Health
DOTS	Directly Observed Treatment, Short course chemotherapy
ENSO	El Ni˜no Southern Oscillation
EPTB	Extra-Pulmonary Tuberculosis
FMoH	Federal Ministry of Health
HIV	Human Immuno-deficiency Virus
HH	Household
ICPs	immunocompromised patients
IDPs	Internal Displaced Persons
IRRs	incidence risk ratios
KII	Key Informant Interview
KAP	Knowledge Attitude and Practice
LTBI	latent TB infection
MDR	Multi drugs resistant
MoH	Ministry of Health
NTP	National Tuberculosis Control Program
PEH	Populations Experiencing Homelessness
PHC	Primary Health Care
PTB	Pulmonary Tuberculosis
SDG	Sudanese Pound
SMoH	State Ministry of Health
TBMU	Tuberculosis Management Unit
TB	Tuberculosis
TST	Tuberculin skin test
OCHA	United Nations Office for Humanitarian Affairs
WHO	World Health Organization
HHCs	Household contacts

Abstract:

Background: Tuberculosis remains one of the leading causes of death worldwide, with the highest incidence rate in Asia (59%) and Africa (26%). Approximately 4% of all new TB cases and 20% of previously treated cases are multidrug-resistant TB (MDR TB), which is characterized by resistance to isoniazid and rifampicin. Sudan shoulders 8% of the tuberculosis burden in the Eastern Mediterranean Region, it has a large population of IDPs, the bad conditions increased the prevalence rate up to 209 cases per 100,000 of the population and 50,000 incident cases in 2009. This study aims to explore the epidemiology (prevalence) of TB and look for the risk factors associated with the disease pre and after TB program activities (interventions).

Methods: A community-based, descriptive cross-sectional study was conducted to study the epidemiology of tuberculosis in Alsalam IDPs camp in South Darfur state 2019 – 2021. The sample was selected to represent all sectors within the camp, it was determined by the following formula: N = (z^2 (p.q))/d^2, which included 401 households in the first part of the study and 398 in the second part of the study. The intervention applied after the first part of the study, include the health education, TB program normal activities, community outreach, reactivate TBMU in the camp etc, data were collected by a questionnaire, used mobile KoBo toolbox application, one person from each selected household was interviewed, besides key informant persons were interviewed, checklist and TB Test; Zihl Nelson Stain method test performed for sputum to confirm all suspected cases, data were transferred from KoBo, cleared, and analysed by the SPSS version 26.

Results: In the first part of the study November 2020, the prevalence rate of tuberculosis was 2.2% (9 cases), 54.86% (220) of the targeted group knew that the signs and symptoms of tuberculosis were chronic coughs, 24.9% (100) of people mentioned tuberculosis is transmitted through cough and air. On the other hand, 53.9% (216) of the targeted group (or people) don’t know the methods of tuberculosis transmission. The study showed a strong link between HHs where more than one person sleeping in a room and TB infection, where those who slept

as 3 persons and more in one room had a high prevalence of 3(0.75%). The study found that the prevalence of TB was 1.25 % (5) lower among those who received health education messages than those who did not. In the second part of the study no positive case detected, the study revealed that the interventions have positive outcome a cross studied TB risk factors.

Conclusion: The epidemiology of TB in the camp studied during the period, the prevalence rate of the disease in the first part of the study found to be 2.2%, After the TB program interventions no case detected in the second part of the study, and it had been confirmed that there were many factors contributed to the high prevalence of TB.

المستخلص:

الخلفية: لا يزال السل أحد الأسباب الرئيسية التي تؤدي للوفاة في أنحاء العالم، مع أعلى معدل للإصابة في آسيا (59٪) وأفريقيا (26٪). ما يقارب من 4 ٪ من جميع حالات السل الجديدة و 20 ٪ من الحالات المعالجة سابقًا هي سل مقاوم للأدوية المتعددة (MDR TB) ، والذي يتصف بمقاومة أيزونيازيد وريفامبيسين. يتحمل السودان 8٪ من إجمالي السل في إقليم شرق المتوسط، ويوجد به عدد كبير من النازحين، وقد أدت الظروف السيئة إلى زيادة معدل الانتشار إلى 209 حالة لكل 100000 من السكان و 50000 حالة حادثة في عام 2009. تهدف هذه الدراسة إلى استكشاف وبائية (انتشار) السل والبحث عن عوامل الخطر المرتبطة بالمرض قبل وبعد أنشطة برنامج السل (التدخلات).

المنهجية: أجريت دراسة مقطعية وصفية مجتمعية لدراسة وبائية السل في معسكر السلام للنازحين بولاية جنوب دارفور 2019 - 2021 وتم اختيار العينة لتمثيل كافة القطاعات داخل المخيم وتم تحديدها من خلال المعادلة الآتية:

N = (z ^ 2 (p.q)) / d ^ 2 ، والتي تضمنت 401 أسرة في الجزء الأول من الدراسة و 398 في الجزء الثاني من الدراسة. تم تطبيق التدخل بعد الجزء الأول من الدراسة، بما في ذلك التثقيف الصحي، والأنشطة الروتينية لبرنامج مكافحة الدرن، والتوعية المجتمعية، وإعادة تنشيط وحدة علاج الدرن في المعسكر، وما إلى ذلك، وتم جمع البيانات عن طريق الإستبيان باستخدام تطبيق KoBo toolbox للهاتف المحمول، تمت مقابلة شخص واحد من كل أسرة مختارة، إلى جانب المصادر الرئيسيين تمت مقابلتهم، وقائمة المراجعة واختبار السل؛ تم إجراء اختبار طريقة Zihl Nelson Stain للعاب لتأكيد جميع الحالات المشتبه فيها، وتم نقل البيانات من تضبيق KoBo وتنظيفها وتحليلها بواسطة الإصدار 26 من برنامج التحليل الإحصائي SPSS.

النتائج: في الجزء الأول من الدراسة نوفمبر 2020 ، كان معدل انتشار مرض السل 2.2٪ (9 حالات) ، 54.86٪ (220) من المجموعة المستهدفة يعرفوا أن علامات وأعراض السل هي سعال مزمن، 24.9٪ (100) من الأشخاص ذكروا أن السل ينتقل عن طريق السعال والهواء. من ناحية أخرى ، 53.9٪ (216) من المجموعة المستهدفة (أو الأشخاص) لا يعرفون طرق انتقال مرض السل. أظهرت الدراسة وجود صلة قوية بين المنازل التي بها أكثر من شخص ينام في غرفة وبين الإصابة بالسل، حيث كان معدل انتشار الأشخاص الذين ينامون 3 أشخاص وأكثر في غرفة واحدة مرتفعًا بنسبة 3 (0.75٪). وجدت الدراسة أن انتشار السل كان أقل بنسبة 1.25٪ (5) بين أولئك الذين تلقوا رسائل التثقيف الصحي من أولئك الذين لم يتلقوا ذلك. في الجزء الثاني من الدراسة، لم يتم اكتشاف أي حالة إيجابية وأن الدراسة كشفت أن التدخلات لها نتائج إيجابية من عوامل اختطار السل المدروسة.

الخلاصة: تمت دراسة وبائية السل في المعسكر خلال الفترة، وجد أن معدل انتشار المرض في الجزء الأول من الدراسة بلغ 2.2٪ ، بعد تدخل برنامج السل، لم يتم اكتشاف أي حالة في الجزء الثاني من الدراسة وتم التأكد من وجود العديد من العوامل التي ساهمت في ارتفاع معدل انتشار مرض السل.

Chapter One: Introduction

1.1. Problem statement

1.2. **Study justification**

1.3. **Study objective**

1. Introduction:

1.1. Problem statement:

The consequences of tuberculosis (TB) on society are immense. Worldwide, one person out of three is infected with Mycobacterium tuberculosis – two billion people in total. TB accounts for 2.5 % of the global burden of disease and is the commonest cause of death in young women, killing more women than all causes of maternal mortality combined. In 2007 TB has held the seventh place in the global ranking of causes of death. It was projected unless intensive efforts are made, it is likely to maintain that position through to 2020, despite a substantial projected decline in disease burden from other infectious diseases (1). Later in the Global TB Report by WHO 2019, it was announced that the first milestone towards one of the targets set in the political declaration at the UN high-level meeting on TB has been achieved: 7 million people were reached with TB care in 2018. Nonetheless, there were still around 3 million people with TB who either had no access to quality care or were not reported, and only one in three people with drug-resistant TB accessed care. There has been an expansion of access to TB preventive treatment, but the numbers currently being reached fall far short of what is needed to reach the target of providing preventive treatment to at least 30 million people in the period 2018–2022. The Global Fund to Fight AIDS, Tuberculosis and Malaria has recently been replenished with more resources than ever before for HIV, TB and malaria, but despite this good news, progress continues to be impeded by shortfalls in domestic and international funding for TB prevention, care, and for TB research (2).

Effective drugs to treat and cure the disease have been available for more than 50 years, yet every 15 seconds, someone in the world dies from TB. Even more alarming: a person is newly infected with M. tuberculosis every second of every day. Left untreated, a person with active TB will infect in an average of 10 to 15 other people every year.

TB hinders socioeconomic development: 75 % of people with TB are within the economically productive age group of 15-54 years, 95% of all cases and 99 % of deaths occur in developing countries, with the greatest burden in sub-Saharan Africa and Southeast Asia. Household costs of TB are substantial.

In most countries, more cases of TB are reported among men than women. This difference is partly because women have less access to diagnostic facilities in some settings, but the broader pattern also reflects real epidemiological differences between men and women, both in exposure to infection and in susceptibility to disease. In regions where the transmission of M. tuberculosis has been stable or increasing for many years, the incidence rate is highest among young adults, and most cases are caused by recent infection or reinfection. As transmission falls, the caseload shifts to the older age groups, and a higher proportion of cases come from the reactivation of latent infection.

While the human immunodeficiency virus (HIV) infection has clearly had a profound effect on TB epidemiology, other potentially important risk factors have been somewhat neglected. In the coming years, more attention needs to be given to the interaction between chronic diseases and TB, including diabetes, under nutrition, and respiratory illnesses caused by tobacco and air pollution (1). In the current epidemic situation, the global healthcare community is facing the spread of Corona Virus Disease 2019 (COVID-19), which exacerbates major health problems pre-existing the pandemic. Tuberculosis continues to pose a threat to lives and public health systems in many countries, due to its characteristics, which are like those of COVID-19: airborne transmission, predominant lung damage, the development of secondary immunosuppression and infection dissemination. COVID19 may worsen the tuberculosis epidemic through different mechanisms: disrupting the routine process of tuberculosis detection, increasing the risk of reactivation of latent tuberculosis infection, and worsening the clinical presentation of active TB. Therefore, it is crucial to describe changes in the clinical presentation and morphological characteristics of TB in patients with a combination of multiple infectious diseases (3).

Although the “direct costs” of diagnosis and treatment are significant for poor families, the greatest economic loss occurs as a result of “indirect” costs, such as loss of employment, travel to health facilities, sale of assets to pay for treatment related costs, and in particular, lost productivity from illness and premature death(1).

1.2. Study Justification:

- Tuberculosis considers one of the top 10 causes of death worldwide, the number of tuberculosis deaths decreased between 2000 and 2016 but is still among the top 10 causes with a death toll of 1.3 million (4).
- Sudan is one of the developing countries with a high prevalence rate of tuberculosis; the second country after Pakistan in the eastern Mediterranean region EMRO, tuberculosis considers one of the public health important events in the country, statistics showed the incidence is 1.2% or 120 TB patients for 100000 populations (5). And recently WHO stated according to the last available data for country profile (Estimates of TB burden 2018) the total TB incidence is 71 per 100 000 populations this is 30000 cases (6).
- In the acute phase of an emergency, when mortality rates are high owing to acute respiratory infections ARI, malnutrition, diarrheal diseases, and malaria (where prevalent), TB control is not a priority. A TB control program should not be implemented until - while mortality rates are below 1 per 10 000 populations per day.
- It is crucial that there is some stability in the population, as all patients commencing TB treatment must complete the full 6- or 8-month treatment course. If there are high rates of treatment defaulters, there is a high risk of development of multidrug-resistant TB. Nevertheless, TB is a particularly important disease in long-term emergencies where refugees or internally displaced persons are in camps or overcrowded communities for long periods (7).
- Darfur has been mired in conflict, insecurity, and mass displacement since 2003. In 2009, there were nearly 4.7 million conflict-affected persons of whom 2.7 million were internally displaced persons (IDPs). While IDPs were largely reliant on World Food Program food distributions, security permitting, a small proportion of IDPs continued to farm their land in the surrounding area (8). It is more than a decade since Darfur has been mired in conflict, IDPs are still in the camp with poor conditions and the

diminishing of the relief and humanitarian aid including health services. People are at particularly high risk of developing TB owing to overcrowding, malnutrition and high HIV seroprevalence. In Kenya in 1993, the incidence of new infectious TB patients in camps was four times the rate in the local population. In two camps in Sudan in 1990, over one-third of all adult deaths were due to TB (7).

- There were a limited number of studies conducted to study the epidemiology of tuberculosis in Sudan and very limited specifically for IDPs camp or related conflict areas. The study was conducted in 2018 in Darfur resulted that between 2004 and 2014 a total of 21,131 new TB cases were reported in the conflict zone (Darfur) versus 43,826 in the non-conflict zone. There were 1822 notified TB re-treatment cases from the conflict and 2024 from the non-conflict zone, the non-conflict zone surpassed the conflict zone in the number of notified new cases per year with a range of 4387-3698 versus 2734-1196, between 2004 and 2014 (9).
- Alsalam IDPs camp is one of the biggest IDPs camps in Darfur as categorized by UNOCHA with IDPs camps greater than 50000 people (10). The camp locates in Nyala South Darfur state established in 2004, received 118984 people (19831 households) according to the last Humanitarian Aid Commission HAC and UNWFP records in 2015, people from different areas around Nyala mainly from the south of the state, the camp has one TBMU operated by Care International NGO with support from the South Darfur state ministry of health, the unit were not working for two years and resumed work in 2018.
- It is seeming that tuberculosis prevention and control programs / interventions neglected by health services providers NGOs and the Ministry of health, it has less priority than other health problems in IDPs camps in Darfur, recent report by the Global Fund to fight TB, HIV and Malaria grands in 2019, recommend that the processes and controls to ensure access to quality services therefore need significant improvement. It

expects that prevalence will be high in IDPs camp and TB program interventions will have positive contribution to factors associated with TB prevalence.

- The study measures the prevalence rate and support intensify TB program intervention to evaluate how this affect the prevalence rate of the disease; intervention is supporting the efforts of National TB program and other stakeholders. This research performed in Darfur where the prevalence has risen since the crisis has been erupted.
- Recommendations will support the objective of NTP program in Sudan which is to reduce the incidence of tuberculosis as minimum as it will not be a public health problem in the country through the following: detecting 70% of smear positive TB cases within the community and reaching 85% cured rate of the detected cases using program identified strategy (5).

1.3. Objectives:

1.3.1. General Objective:

To study the epidemiology of tuberculosis among Internally Displaced Persons at Alsalam IDPs camp 2019 – 2021.

1.3.2. Specific Objectives:

1. To measure the prevalence rate of tuberculosis
2. To identify the risk factors associated with TB prevalence rate
3. To assess the effectiveness of TB related interventions to TB prevalence rate among Internal Displaced Persons in Alsalam camp
4. To determine the Knowledge attitudes and practices of study group toward TB

Chapter Two:

Literature Review

2. Literature review:

2.1. Background:

Tuberculosis (TB) is a disease most commonly affecting the lungs, but also other organs (7). Tuberculosis has a long history, as it appeared before the beginning of recorded history and has left its mark on human creativity, music, art, and literature; as well as influenced the advance of biomedical sciences and healthcare. Its causative agent is *Mycobacterium tuberculosis*, which killed more persons than any other microbial pathogen. This bacterium was discovered by Robert Koch on March 24, 1882, in Berlin (1).

The *Mycobacterium tuberculosis* complex includes *M.tuberculosis* and *M.africanum*,which are primarily isolated from humans, and *M.bovis*,that primarily isolated from cattle. *Mycobacterium tuberculosis* and *M. africanum* are transmitted by exposure to the bacilli in airborne droplet nuclei produced by people with pulmonary or laryngeal TB during expiratory efforts, such as coughing and sneezing. Bovine TB results from exposure to tuberculous cattle, usually by ingestion of unpasteurized milk or dairy products, and sometimes by airborne spread to farmers and animal handlers. The incubation period is about 2–10 weeks; latent infections may persist throughout a person's life (7).

Tuberculosis TB continues to be one of the leading causes of death worldwide, and the largest prevalence rate of this disease was recorded in Asia (59%) and Africa (26%). Approximately 4% of all new TB cases and 20% of previously treated cases are multidrug-resistant TB (MDR TB, characterized by resistance to isoniazid and rifampin). Refugee and displaced populations are known to be at increased risk for TB. This finding is believed to be caused, in part, by increased risks for malnutrition and overcrowding, which lead to increased susceptibility to and transmission of TB (11).

Tuberculosis TB is a global emergency. Of the world's population, one-third is infected with TB. The World Health Organization (WHO) estimates that 8.8 million people develop active TB disease every year. Of these people, 95% live

in developing countries. More than 75% of TB-related disease and death occurs among people between the ages of 15 and 54, the most economically active segment of the population. It is estimated that TB kills 1.5 to 2 million people each year - on average, one person every 15 seconds. Of these deaths, about 98% are in developing countries. There are 22 high burden countries (countries with the greatest number of TB cases). These countries account for roughly 80% of the world's TB burden and focus on the global effort for TB control (12).

The Republic of Sudan has a large population of internally displaced persons. It has a high burden of TB, with a prevalence of 209 cases per 100,000 of the population and 50,000 incident cases in 2009 (13).

2.2. Definition:

Tuberculosis (TB) is a disease caused by bacteria that are spread from person to person through the air. TB usually affects the lungs, but it can also affect other parts of the body, such as the brain, the kidneys, or the spine. In most cases, TB is treatable and curable; however, persons with TB can die if they do not get proper treatment (14).

Tuberculosis (TB) is an infectious disease caused by group of highly-related organisms comprising the *Mycobacterium tuberculosi*s complex (MTBC), which includes *M. tuberculosis, M. africanum, and M. bovis*. Although all members of MTBC might cause disease in humans, *M. tuberculosis and M. africanum* are the primary cause of disease in humans globally, whereas *M. bovis* primarily causes disease in cattle. Like *M. tuberculosis, M. africanum* is spread by aerosol transmission (15).

2.3. Epidemiology of tuberculosis:

Epidemiology defines as the study of the distribution and determinants of health-related states or events in specified populations and the application of this study to control of health problems (16).

The extent of tuberculosis and its evolution over time defines its epidemiology. Epidemiology provides the basis for public health practice needed to control the disease. Various epidemiological indices are employed that differ in complexity.

Mortality: The number of deaths caused by the disease has traditionally defined the extent of the tuberculosis epidemic. Mortality is expressed as the number of tuberculosis deaths per unit of population (usually 100 000) and per unit of time (usually per year). However, this information is not reliably collected in most countries where tuberculosis is common.

According to WHO's estimations, more than 1.9 million deaths due to TB occurred worldwide in 1997: more than 1 million in South-East Asia, fewer than 42 000 in industrialized countries, with the other cases distributed in the other regions of the world. TB is the cause of an estimated 2.8% of deaths in the world in all age groups — and 26% of avoidable deaths in developing countries.

Morbidity: Tuberculosis morbidity is expressed by two main indices; prevalence and incidence.

The prevalence of a disease is the number of cases of disease present in the community at any given point in time per unit of population (usually 100 000). The prevalence rate can be determined only by surveys that conducted on representative samples of the general population. These surveys are costly and difficult but have been conducted in certain countries to monitor the epidemiological trend of tuberculosis.

Incidence is expressed by the number of cases of a disease newly occurring over a specific period of time (usually one year) per unit of population (usually 100 000). An estimation of incidence is obtained from notifications of new cases. The estimation is inexact because not all cases that occur during the year are diagnosed, and those that are diagnosed are not always notified. The incidence of tuberculosis cannot be accurately estimated by notification of cases; in general estimations of incidence based on notified cases is lower than the real incidence, as only 30–60% of cases are notified in many countries.

The number of new cases notified (i.e., all cases of TB put on treatment for tuberculosis) is expressed per 100 000 populations, according to the estimated population for the year in question. The notified cases are usually specified by type (i.e. pulmonary TB, smear-positive or smear-negative, extra-pulmonary).

The incidence of tuberculosis can also be predicted from estimates of the incidence rate of tuberculous infection. This is reliable only in regions that do not have a high incidence rate of HIV.

W.H.O estimated that there were 7.96 million new cases worldwide in 1997, more than half of which were infectious. Most cases (95%) were thought to occur in the poorest countries. 95% of individuals with tuberculosis live in the poorest countries: because of the poor health coverage of the population, only a proportion of these patients are detected and treated.

In countries with high income; have an average income of US$ 6000 per person per year. The average annual incidence of tuberculosis in industrialized countries is 30 per 100000 populations, ranging from 5 to 50 per 100 000. The majority of these countries have an incidence of less than 20 per 100000 per year. Until the 1980s, tuberculosis rates were gradually declining in these countries. The first, so-called “natural”, decline occurred coincident with a rise in living standards of the population before the chemotherapy era; it then accelerated with the discovery of specific anti-tuberculosis drugs and approached levels that were close to the elimination of tuberculosis in some countries that had implemented effective control programs. The reversal of this declining trend was noted as early as 1979 in big cities in the USA, with the greatest increases recorded in New York City. This increase mainly involved individuals aged under 45, African-Americans, Hispanics and immigrants from Asia and the Pacific. The overall increase in the USA was halted in 1993. This increase in notification rate in the USA was accompanied by an increase in mortality, particularly in those aged 20–49 years, in states with large urban populations where there were a high proportion of both HIV-infected and poor or homeless individuals. This phenomenon was also observed in a number of European countries, particularly in the big cities. This

increase in tuberculosis notification rate was associated with the dismantling of general health services — including tuberculosis control services — for poor people, with migration of populations from countries with a high tuberculosis burden and, to a lesser extent, with the appearance of HIV infection. The recent increase in tuberculosis in high-income countries is due principally to the dismantling of tuberculosis control services and to migration of people from countries with a high tuberculosis burden, to social exclusion of disadvantaged groups, and, to a lesser extent, to the emergence of the HIV epidemic.

In countries with low and intermediate income (Low-income countries) have under US$ 600 incomes per person per year; intermediate countries have an income between US$ 600 and US$ 6000 per year. Tuberculosis incidence cannot be based only on the incidence of notified cases, which in general is lower than real incidence because only 30–60% of TB cases are diagnosed and reported.

According to WHO estimates, in 1997 nearly 3 million cases occurred in South-East Asia, i.e., more than 40% of all global cases.

In each region the rate of new cases of TB differs from one country to another, depending not only on the density and geographical distribution of the population, but also on the quality and extent of the National Tuberculosis Program.

The highest estimated annual incidence of new cases is in Africa (259/100 000), closely followed by South-East Asia (202/100 000); the lowest incidence in the group of low-income countries is in the Americas (without Canada and USA, 79/100 000). The lowest incidence of new cases of tuberculosis among the WHO regions is in Europe, with 51 cases per 100 000 (17).

In the 2014, TB survey in Sudan results indicated a prevalence of 159/ per 100,000. The survey results showed a higher TB prevalence rate among young, urban settings and male population. In 2017, the estimated TB incidence was 77/ per 100,000 which gave 31,000 cases and a mortality rate of 12/100,000. For last decade, TB cases notified remained relatively constant, in a range of 19,817 - 22,097. In 2016, the total notification was 21,091. Of these 19,305 (91.5%) new cases and 1,786 (8.5%) previously treated. Out of new cases, 6,520(30.9%) were

smear positive, 6,167 (29.2%) smear negative, 4,951 (23.5%) Extra-pulmonary and 1,667 (7.9%) sputum not done. Children represent 11-13% of all notified cases (18).

Identification of epidemiological factors affecting the prevalence rates of TB is fundamental and crucial for decision makers enabling them having the appropriate strategy to minimize the incidence rate of the disease and identifying the risk factors helping in its distribution (19).

2.3.1. Agent factor:

In the majority of cases, TB is due to *Mycobacterium tuberculosis* (Kock's bacillus), *M.africanum* may be observed in western Africa (it is naturally resistant to thioacetazone). In both cases, humans are the only reservoir of bacilli. In less than 1% of cases, infection may be due to *M. bovis*, whose reservoir is infected cattle. In some regions (Djibouti) TB can be caused by *M. canettii*.

Mycobacterium tuberculosis multiplies more slowly than the majority of bacteria; this is why TB has slower evaluation than most of other bacterial infections.

Mycobacterium tuberculosis is strictly aerobic bacteria; it therefore multiplies better in pulmonary tissue (in particular at the apex, where oxygen concentration is higher) than in the deeper organs (20).

Individuals infected with the tubercle bacillus can develop tuberculosis disease at any time. Cases of pulmonary TB are highly contagious when they are smear-positive and represent potent sources of infection, thus completing the cycle of transmission. Immunity due to the formation of circulating antibodies plays a marginal role in tuberculosis, as the mycobacteria are resistant to the direct effect of antibodies and their products. However, the existence of these antibodies is the focus of research into new methods of serological diagnosis of tuberculosis (17).

2.3.2. Host factors:

The host is the man for the human type and the cattle for bovine type and ovian. Only the human and bovine are of major clinical importance the following are the main host factors:

Age distribution of tuberculosis: TB affects all ages. In the developed countries the disease is now more common in the elderly (21). Tuberculosis kills more young people and adults than any other infectious disease; someone dies of tuberculosis every 10 seconds. In countries with a high population growth Tuberculosis affects mainly young, economically active adults, and thus has huge economic, social and familial repercussions. Furthermore, this age group, which also corresponds to a period of sexual activity, is most exposed to the risk of HIV infection, which explains the increase in the number of tuberculosis cases in certain high TB prevalence countries heavily affected by the HIV epidemic. In the poorest countries, demographic growth, rapid urbanization, the absence or recent creation of as yet ineffective National Tuberculosis Programs, and the emergence of the HIV epidemic, are reasons for the increases in the incidence of tuberculosis. In countries with a low population growth, the age groups that are the most affected by tuberculosis are adults aged over 55 years, as infection by the tubercle bacillus in these countries was more common when these individuals were young. The greater risk of having been infected by the tubercle bacillus in their youth emerges as disease many years later. Young adults in these communities are much less exposed to the risk of infection and have little disease. In these countries tuberculosis is a much rarer manifestation of HIV infection than in countries with a high prevalence of tuberculosis, as young HIV-positive adults are rarely co-infected with tuberculosis and the number of sources of tuberculosis infection in the community is much lower (17).

Sex distribution: Broadly, gender is "what it means to be male or female, and how that define a person's opportunities, role, responsibilities and relationships". Since the concept of gender, distinct from sex, was developed during 1970s, extensive literature has accumulated on gender in health and development. Traditionally, women have had to face much greater health risk; confront many more constrains and make do with much fewer opportunities in trying to resolve their health needs than men. Gender also plays a role however in men's health problem – their prunes to accidents, addiction, and violence for instance. As they

affect women, gender relations reflect power relations: within each category `woman` and `man` is a hierarchical ordering of status that leads to inequity in the health and wellbeing of women in relation to men, in most of the world, more men than women diagnosed with TB and die from it (22). However, many studies showed that tuberculosis is more prevalent in male than in females. While females often predominate among tuberculosis cases in those under 20 years of age, there is a predominance of males among all notified tuberculosis cases and among those dying from tuberculosis in most countries. Among women, tuberculosis kills more women than any cause of maternal mortality (17).

Heredity: Tuberculosis is not a heredity disease. However twin studies indicate that inherited susceptibility is an important risk factor.

Nutrition: Malnutrition is widely believed to predispose to tuberculosis, but the available evidence on this point is only indirect.

Immunity: Man has no inherited immunity against TB . It is acquired as a result of natural infection or BCG vaccination. Past infection with atypical mycobacteria is also credited with certain amount of naturally acquired immunity (21).

2.3.3. Socioeconomic, Environmental, and other factors:

There are many environmental factors that can influence the infection and transmission of TB it is difficult to identify varies environmental influences which may affect resistance to tuberculosis because several adverse factors tend to be found together. The following may be considered, nutrition status and food availability, housing conditions, occupation, toxic factors, environmental hygiene and social factors.

Mainly there are four factors can modify TB epidemiology: socioeconomic development, BCG vaccination, TB treatment and HIV infection.

In European countries, the incidence and specific mortality of TB have diminished by 5 to 6% per year since 1850. This progressive improvement dates to before the era of vaccination and antibiotics and was contemporary with socioeconomic development (improvement of living conditions, nutrition status of populations,

etc.). TB is the disease of the poor: over 95% of cases in developing countries are from poor communities. In industrialized countries, TB generally affects the most disadvantaged social groups (8). 95% of individuals with tuberculosis live in the poorest countries; because of the poor health coverage of the population, only a proportion of these patients are detected and treated (17).

2.3.4. Mode of transmission:

Tuberculosis can affect any organ in the body. Pulmonary tuberculosis is the most frequent site of involvement; extra-pulmonary tuberculosis is less frequent. Only pulmonary tuberculosis is infectious, the causal agent is *Mycobacterium tuberculosis* (the tubercle bacillus) (17). Transmission of the bacillus is human-to-human (except *M. bovis*). TB is mainly transmitted by airborne transmission. The source of infection is a patient with pulmonary (or laryngeal) TB who expectorates *bacilli*. During coughing, speaking, or sneezing, the patient produces tiny infectious droplets from the bronchial tree; an aerosol of droplets each of which contains several bacilli, these droplets dry out and remain in the air for several hours (20).

The number of infectious droplets projected into the atmosphere by a patient is very high when coughing (3500) or sneezing (1 million). When they come into contact with the air these droplets rapidly dry and become very light particles, still containing live *bacilli*, that remain suspended in the air. In an enclosed space, the droplets can remain suspended for a long time, and the bacilli remain alive for several hours in the dark: these are “infectious particles” (17).

Contamination occurs when infectious droplets are inhaled. Sunlight and ventilation are effective in decontaminating the environment (20); direct sunlight rapidly destroys the *bacilli*, letting air and sunshine into rooms where TB patients live can reduce the risk of infection for those living in contact with them (17).The other modes of contamination are far less common; cutaneous or mucous inoculation of laboratory personnel, or digestive contamination in the event of *bovine TB* (20); small proportion of cases, the bacillus is transmitted to humans

from infected cows through drinking non-sterilized milk. This mode of transmission plays only a minor role in the natural history of the disease in humans (17).

The infectiousness of a patient is linked to the quantity of bacilli contained in his/her sputa. Patients with sputum smear-positive microscopy (M+) are by far the most contagious. Those with only culture-positive results (M-, C+) are less contagious. Patients whose sputum smear microscopy and culture are negative (M-, C-) are usually not contagious.

Patients suffering from primo-infection are not contagious. Extra-pulmonary (EP) forms of the disease are only contagious in exceptional circumstances. Children are generally not contagious due to weaker cough mechanics and less sputum production.

It is estimated that a person with TB M+, undiagnosed and untreated, contaminates 10 to 20 people per year (this varies according to lifestyle and environment). Approximately 10% of HIV negative persons infected with the *TB bacillus* will develop active disease during their lifetime with the greatest risk in the first two years following infection. About 55% of those patients with active disease have the contagious pulmonary form.

The greatest factors contributing to transmission are the closeness of contact with the infectious source, the duration of exposure, and the bacteriological status of this source (20). When people live or sleep near a patient, they are at risk of inhaling infectious particles. When a person inhales infectious particles, the large particles, are deposited on the mucous of the nasopharynx or the tracheo-bronchial tree and are expelled by mucociliary clearance. The smallest particles, less than a few microns in diameter, can penetrate to the alveoli. The closer and the more prolonged the contact with an infectious patient, the greater the risk of infection, as this risk is linked to the density of the bacilli in the air the individual breathes and the amount of the air inhaled. As a result, children living in the same household as a source of infection are at a particular risk of becoming infected (17).

2.4. Clinical symptoms:

The period from infection to development of the first symptoms is usually four to 12 weeks, but the infection may persist for months or even years before the disease develop. A person with the disease can infect others for several weeks after he or she begins treatment.

The symptoms of TB include general weaknesses, weight loss, fever, and night sweats. In the pulmonary tuberculosis, the symptoms include persistent cough, a cough lasting for more than 2-3 weeks, Chest Pain, Chills, Discolored or bloody sputum, fatigue, loss of appetite, pain with breathing, severe headache, shortness of breath, slight fever, tiredness or weakness, weight loss. In young children, however, the only sign of pulmonary TB may be stunted growth or failure to thrive. Other signs and symptoms depend on the part of the body that is affected. For example, in tuberculosis of the bones and joints there may be swelling, pain, and crippling effects on the hips, knees, or spine (5).

2.5. Diagnosis:

The term case detection used by WHO, means that a patient is diagnosed as having TB (correctly or incorrectly), and is reported within the national surveillance system, and then to WHO. Smear-positive cases are the focus of the DOTS program because they are the principal sources of infection to others, because sputum smear microscopy is a highly specific (if somewhat insensitive) method of diagnosis, and because patients with smear-positive disease typically suffer higher rates of morbidity and mortality than smear negative patients (23).

Bacteriological examinations include sputum smear microscopy it allows a simple and reliable identification of patients with M+ PTB but has low sensitivity. A culture is much more sensitive but requires a more equipped and qualified laboratory. A culture and drugs susceptibility allows diagnostic confirmation and allows precise identification of mycobacterium species involved and used for mostly advance diagnosis like MDR TB and the differentiation between live and dead bacilli as this is important in the treatment follow-up.

Tuberculosis can also be diagnosed with the aid of other techniques that allow a presumptive diagnosis and sometimes confirm pulmonary and extra-pulmonary form. Radiography used for pulmonary TB; chest x-ray useful for the diagnosis of M- PTB and TB in children.

Tuberculin skin test (PPD) it is cutaneous hypersensitivity to tuberculin reflects a delayed hypersensitivity reaction to M. Tuberculosis antigen. A positive reaction signifies that an infection has occurred, but it does not determine if the TB is latent or active and is not synonymous with immunity (20).

It is prepared from metabolic products of *M. tuberculosis bacilli*, and therefore contains a number of poly antigenic proteins. In infected subjects, intradermal injection of tuberculin provokes the liberation of lymphokines that cause a delayed-type hypersensitivity reaction, demonstrated by the appearance 24–72 hours later of a localized infiltration of inflammatory cells into the skin, causing a swelling at the site of injection.

The delayed-type hypersensitivity reaction induced by microbial antigens of *M. tuberculosis* is also induced by *BCG bacilli*, and by certain environmental mycobacteria. The tuberculin skin test reaction is used: In individuals, to diagnose tuberculous infection. A significant reaction indicates that the subject has been infected by mycobacteria at some stage. It does not provide proof of tuberculosis disease. TST in the community, surveys using the tuberculin skin test in a representative sample of non-BCG-vaccinated children determine the proportion of infected subjects in the sample. This proportion provides an indication of the rate of infection in this community, from which the annual risk of tuberculosis infection (ARI) can be calculated (17). There are many other examinations like Anatomopathological examination and biological examinations (20).

Serological tests attempt to demonstrate the presence of circulating antibodies, using mycobacterial antigens. The recognition of antigens by the antibodies present in infected individuals could aid in the diagnosis of disease at certain extra-pulmonary sites for which diagnosis by bacteriology or histology is difficult.

However, these costly tests are not yet sufficiently sensitive or specific to be of routine practical use.

Microscopy and culture are currently the two methods most widely used to confirm the diagnosis of tuberculosis. The more sophisticated techniques, particularly molecular biology, are inefficient and have no place in patient management in countries with a high prevalence of tuberculosis. For pulmonary tuberculosis, the recommended method of examination is microscopy. A series of three samples (at times two or three series) is necessary.

For suspect cases that are not confirmed by smear microscopy, at least three cultures should be performed when a laboratory capable of performing culture is available.

For extra-pulmonary tuberculosis, smear microscopy is usually negative. The diagnosis may be confirmed by culture of a pathological sample or by histological examination of a biopsy of the affected tissue or organ (17).

2.6. Prevention and control of tuberculosis:

Tuberculosis control means reduction in prevalence and incidence of disease in the community. The WHO defines that "control" is said to be achieved when the prevalence of natural infection in the age group 0 – 14 years is of the order of a 1%, (21). Almost all developing countries attempting to provide health services for their population have had to rely on limited resources, including funds, facilities and trained personnel, to cope with a vast unmet demand for health care for a variety of serious health problems. A typical response to this dilemma was the establishment – often with external urging and assistance – of special programs aimed at specific diseases or conditions. The selection of health problems to be talked and methods to be used was often strongly influenced by external donors and indigenous doctors with specialized interests. Thus there came into being in many countries a set of vertical single-purpose program each with a virtually independent infrastructure responsible for its planning, staffing, supplies and evaluation. These programs competed, as well as with any existing

system catering to the treatment of common illnesses, for scarce local and external resources. All failed to satisfy the needs of the population, often even in the short term. In many developing countries progress in establishing integrated tuberculosis control activities has been very slow in eighties. Since the tuberculosis continued to attack millions of people every year, particularly in the less developing countries, new imaginative approaches were badly needed (24).

Later, prevention and control have given special consideration and specialized programs have been established within countries, currently the global fund has a program provides support to combat TB, Malaria and AIDS over the world. TB was one of the main millennium development goals MDG goals' indicators set by UN committee in 2000 to combat HIV, Malaria and other diseases, which is continuing in the current sustainable development goals SDGs.

Since tuberculosis is an infectious disease, the basic principles of prevention and control are the same as for any other infectious diseases. The control measures consist of a curative component – namely case finding and treatment; and a preventive component – namely BCG vaccination. These are the two fundamental components of a national tuberculosis program. The most powerful weapon, however, is the combination of case finding and treatment (21). Health education for behavior change and community outreach in addition to others are crosscutting components for TB programs contributing to prevention and control. World celebrate each year; World TB Day is observed on March 24. This annual event commemorates the date in 1882 when Dr. Robert Koch announced his discovery of *Mycobacterium tuberculosis*, the *bacillus* that causes tuberculosis (TB). World TB Day provides an opportunity to raise awareness about TB-related problems and solutions and to support worldwide TB control efforts (25).

2.6.1. Tuberculosis Treatment:

The development of effective treatment for tuberculosis has been one of the most significant advances during this century. With the evaluation of controlled trials, the chemotherapy of tuberculosis is now more rationally based, than in the

treatment of other infectious diseases. Chemotherapy is indicated in every case of active tuberculosis. The objective of treatment is cure – that is, the elimination of both the fast and slowly multiplying bacilli from patient's body. The treatment should be easily available free of charge to every patient detected. The patient must take the correct drugs at the correct dosage for correct length of time; incomplete treatment puts patient at risk of relapse and development of bacterial resistance and, importantly, the community at risk of infection with resistant organisms. There are now twelve or thirteen anti tuberculosis drugs active against *Mycobacterium tuberculosis* of which six are considered to be essential (21).

The standardized regimens for anti-TB treatment include five essential medicines designated as "first line": isoniazid (H), rifampicin (R), pyrazinamide (Z), ethambutol (E) and streptomycin (S), dose given according to weight.

All TB patients with strain susceptible to the first line drugs must be treated with same treatment regimen for 6 month or 12 months according to the site of involvement. For treatment of new and retreatment cases of pulmonary or extra-pulmonary TB, the standardized regimen consisting of two phases: 1) the initial (intensive) phase: uses four drugs (rifampicin, isoniazid, pyrazinamide, and ethambutol) administered for two months. This is followed by 2) a Continuation phase: with two drugs (rifampicin and isoniazid) for four months (18).

Statistics in Sudan showed that, the treatment success rate of new and relapsed cases registered in 2012 was 75.0%. Drug-resistant tuberculosis is estimated at 1.9% among new cases and 20.0% among previously treated cases (26).

2.6.2. Tuberculosis Vaccination:

BCG is the only widely used live bacterial vaccine. It consists of living bacteria derived from an attenuated bovine strain of tubercle bacilli. The bacilli used for vaccine production are descendants of the original Calmettestrain of BCG (21). BCG vaccination has virtually no impact on the transmission of tuberculosis, as its preventive effect on the infectious forms of tuberculosis is limited. Nevertheless, as it is effective in preventing serious and life-threatening forms of

tuberculosis in infants and young children, BCG vaccination continues to be recommended in countries where tuberculosis is common. BCG vaccination is applied as part of the Expanded Program on Immunization EPI. The basic immunological process explains the action of the BCG vaccination. As the vaccine is prepared from live attenuated tubercle bacilli that have lost some of their virulence, the introduction of these bacilli into the body provokes the same immunological reactions as primary infection with tubercle bacilli, without leading to disease. BCG vaccination confers partial immunity, essentially against the consequences of primary infection, and particularly against the acute forms of tuberculosis in children (17).

The WHO recommends vaccination for all newborn infants as soon as possible after birth in order to: 1) allow the maximum number of children to be reached, because in many areas birth is one of the rare occasions where people are in contact with healthcare structure, 2) avoid leaving newborn infants (which may have close contact with potentially contagious adults) without protection for several months. BCG is given as single dose, 0.05 ml as soon after birth as possible if the child is over one-year-old 0.1 ml as single dose, it is an injection given into the external face of the left arm just above he attachment point of the deltoid. The vaccine is injected in the same place for all to make it easy to find the BCG scar subsequently.

Children who could not be vaccinated at birth receive BCG in their first year, at the same time as other vaccinations. During vaccination campaigns or at vaccination centers, all children under 15 years of age who don not present a vicinal scar on their left arm should be vaccinated. The objective of the EPI program is to obtain vaccination coverage of at least 80%in the age of 1 – 2 years old age group.

In the BCG efficacy published studies offer conflicting results, with protection varying from 0 to 80%. Surveys showing high BCG effectiveness appear less controversial than those showing low or no effectiveness. When BCG is correctly carried out, it confers protection that is not insignificant (probably over 50%). It

has been proven that BCG protects against severe forms of the disease, in particular TB meningitis and military TB (20).

2.7. National Tuberculosis Program NTP Sudan:

The Republic of the Sudan is the third largest country in Africa and has a population of 39 million. A federal state, it is comprised of 18 States divided into 184 localities. Classified as a lower-income country by the World Bank, Sudan ranks 167 out of 189 countries in the 2018 UNDP Human Development Index and 175 out of 180 in Transparency International's 2017 Corruption Perception Index (27), it was, the largest country in Africa prior to the referendum that have separated the Southern region in 2011, is home to one of the world's oldest civilizations with the most ethnically and linguistically diverse populations on the planet. Negatively affected by conflict and political and economic uncertainty, the worsening humanitarian situation is a victim of these circumstances (28). Armed clashes continue in certain areas (South Kordofan, Blue Nile, and Darfur) and two million people are displaced, affecting access to health services (27). Among the many health, socioeconomic and development challenges that the country is currently facing; tuberculosis represents just one of the challenges.

In Sudan, historically, the incidence rate of tuberculosis started increasing at the end of the 1930s/the beginning of the 1940s, coinciding with the start of the Second World War. In recognition of the urgency of the problem, the Government initiated a pilot tuberculosis control program based on hospitalization, supervision, and prompt investigation of contacts. W.H.O was at the forefront of this effort and in the 1950s, the Organization sent expert missions to assist the Government's efforts. In 1993, the Federal Ministry of Health, in collaboration with WHO, launched a nationwide tuberculosis control program based on the adoption of the directly observed treatment, short course (DOTS) strategy (28).

A nationwide tuberculosis management units' network has been maintained since 1994 providing anti-tuberculosis drugs and tuberculosis microscopy services free of charge, with supply integrated into the central medical supplies system. A mix

of home and facility-based directly observed treatment, short-course is used for treatment of patients, and 25 private clinics are involved in the management of tuberculosis cases according to national tuberculosis program guidelines (26).

However, despite the long history of tuberculosis care and the progress made in Sudan, the country is still ranked among the top three countries with the highest tuberculosis burden in the Eastern Mediterranean Region. The case detection rate is under 50% and people are dying of a completely preventable and curable disease (28).

Tuberculosis has remained a major problem in Sudan during the last decade, with the number of new and relapsed cases ranging from 19,817 – 22,097 per annum. In 2017, 104 patients were diagnosed with MDR-TB and 102 enrolled in treatment, TB/HIV co-infection mortality was low: 0.56 per 100,000, with 1.8 TB-HIV incidents per 100,000. While TB incidence of 77 per 100,000 populations, representing 31,750 people in 2017. And 21,054 people with TB treated in 2017. The treatment success rate in 2016 of 78% (27).

Tuberculosis care and treatment is provided by the National Tuberculosis Control Program under the auspices of the Ministry of Health and by a number of non-governmental organizations (NGOs) who provide care to displaced persons, including those living in refugee camps. Treatment is also provided by the private sector. The Sudan National TB Program treatment policy was for an intensive phase of rifampicin, isoniazid, pyrazinamide and streptomycin daily under direct supervision for two to three months until the patient became smear negative followed by eight months of isoniazid and ethambutol (13).

World Health Organization has set national tuberculosis program principles as the overall objective of global tuberculosis control is to reduce deaths due to the disease, to lower the occurrence of the disease itself, and finally to drastically reduce the transmission of infection. To achieve this objective, WHO has:

1- Adopted a new strategy for tuberculosis control.
2- Defined specific objectives for tuberculosis control.

3- Announced a series of measures to be implemented by those countries wishing to put in place an efficient tuberculosis program.

The global strategy for TB control prioritizes the detection of smear-positive cases and appropriate and effective treatment using short-course chemotherapy, which should be directly observed at least during the initial phase (17).

National TB program Sudan follows WHO's strategy, principles and objectives, so the objective of national TB program NTP Sudan is to reduce the incidence of tuberculosis as minimum as it will not be a public health problem in the country through the following:

- To detect 70% of smear positive TB cases within the community
- To reach 85% cured rate of the detected cases

The program uses the following strategy:

- Improve smear positive TB diagnosis through unification of case detection methods confirming the important of the direct sputum test.
- Insure TB drugs available
- Use update system for statistics and registration
- Continues training for TBMUs staff
- Advocacy and community mobilization through the health education to raise the awareness among patients and the community.
- Monitoring, Evaluation and supervision to ensure performance quality.
- Scientific and field research in all aspects related to TB as Public health problem (5).

Recent report (April 2019) of the global fund grands to the republic of Sudan has noticed that there are shortcomings related to the quality of services, including the use of clinical symptoms to diagnose Malaria, sub-optimal viral load testing for HIV/AIDS patients, and poor progress towards the TB/MDR target (currently at 30% of target). The processes and controls to ensure access to quality services therefore recommended as need significant improvement (27).

2.8. Previous studies:

Tuberculosis as a global public health problem has given a priority in research by donor's funds and governments as well as academic institutes, there a thousand of research's in many aspects of TB; the renewed efforts have led to new insights into the biology and epidemiology of this devastating disease. Although of research amount generally there are limited researches match with this study; prevalence and risk factors of tuberculosis, below some highlight of relevant previous studies in Sudan and in the world.

2.8.1. Previous studies in Sudan:

Below is a highlight of relevant studies related to TB previously conducted in Sudan:

1- A descriptive cross-sectional and retrospective study was conducted in Khartoum to evaluate and describe the tuberculosis control program in Khartoum State, Sudan in 2006; it was aiming to find out if the program achieved its global targeted goals; and to identify the challenges and needs for performing a good standard tuberculosis control program. Targeted tuberculosis control departments at the levels of the state (Khartoum), 7 localities, 19 health areas and 42 health facilities. Records review and group interviews were used to collect the required data. The study found that the TB control program in Khartoum State achieved a 77.2% case detection rate of the smear-positive cases, and 73.5% treatment success rate, and a case fatality rate of 2.2%, treatment failure rate of 2.2%, and default rate of 14.1%. There was no system to detect the prevalence of MDR-TB (multi-drug resistant TB) or HIV (human immunodeficiency virus) among the TB cases. The program was not well implemented at locality or health area levels. Conversely, drugs and laboratory supply systems were functioning well. The study concluded that the tuberculosis control program in Khartoum State is centralized, not updated and does not achieve the targeted goals (29).

2- **The recent** main factor and challenge facing TB programs success and prevalence is the MDR. In a cross-sectional study during 2011, conducted in East Sudan Kassala, to study Multi-drug resistance tuberculosis, study found that drug resistance M. tuberculosis in Kassala State was high (30%) and was found to be mainly (83.3%) due to mutations in the rpoB gene (30).

3- **In another** studies conducted by WHO in Sudan, however WHO stated that that a total of 30 operational research studies on priority areas of the national tuberculosis program have been conducted. One of the most important challenges to the program is improving referral of suspected cases from the widely expanding primary health care facilities network to the tuberculosis management units. Other challenges include the establishment of a comprehensive multidrug-resistant tuberculosis management system, comprehensive implementation of collaborative tuberculosis and HIV activities, and ensuring strict implementation of infection control measures in tuberculosis management units (31).

4- **In another pilot** study in Sudan, seeks for giving some information about the prevalence of TB in patients in different areas of the Sudan and collating that with some epidemiological factors as age, sex, social factors, and ethnic groups. And to compare between different diagnostic methods mostly used in a country like Sudan; study included 243 suspected TB patients in TB clinics in any of three cities located in different parts of the Sudan. Khartoum (Central), Port Sudan (Eastern), and Al Obeid (Western). The study resulted that TB is spread all over Sudan, and showed more males than females were found to have TB (187:57). In the study, the number of males was 186 (74.7%). Of them, 72 were workers (30.4%), 26 were farmers (10.7%),30 were free workers (unskilled labourers) (12.3%), 27 were unemployed (11.9%), 16 were students (7%), 11 were drivers (4.9%), and 4 were soldiers (1.6%). The number of females included in this study was 57 (25.3%). Of them, 35 were housewives (14.4%), 6 were female students (2.5%), 14 were workers (5.7%), and 2 were teachers (0.8%).

while 78 (31.8%) were single, 10 (4.0%) were widowed, and 7 (3%) were divorced. According to the residence of the patients, which was classified as urban and rural, 156 (64.1%) were urban and 87 (35.9%) were rural. 34 (8.1%) of them live in houses made of concrete, 78 (32.1%) in houses built of bricks, 90 (37%) built of mud; the remaining houses were 35 (14.4%) Gutiya, 4 (1.0%) Birish, and 2 (0.5%) made of straw.93 (38.3%) patients were illiterates and 18 (7.4%) went to khalwa while the educated groups vary in their education from primary to university, 66 (27.4%) had primary education, 8 (3.3%) stopped at the intermediate level, 48 (19.8%) had a secondary level of education while only 3 (1.1%) went to university. The patients belong to different tribes from different parts of Sudan. The highest number of the cases was Falata, Nuba, Dinka, and Beni Amir while the least incidence was in Hasaniya, Angsana, and Tama. The patients' common complaints were cough, fatigue, headache, chest pain, shortness of breath, fever, loss of weight, and haemoptysis. The cough was the most common complaint. The patients included in the study commonly complained of cough, fever, and shortness of breath. The duration of these symptoms varied from 6 weeks to 3 years. Of the 243 subjects included in the study, 179 (74%) were new cases, 44 (18.1%) were relapses, 16 (6.5%) were patients with interrupted anti-TB treatment, and 4 (1.8%) were cases of failure of treatment. Of the study participants, 179 (74%) had no history of treatment while 64 (26%) received first-line anti-TB treatment. Microscopic result Two hundred and forty-three sputum samples from TB patients included in the study were processed for staining using ZN stain and examined by the light microscope. 207(85.2%) of them were positive showing AFB in ZN stain. Cultures of sputa from 191 of 243 pulmonary TB patients (78.6%) were positive for *mycobacteria*. 149 (75%) were successfully sub-cultured on LJ. 19 (13%) cultures were contaminated and only 149 isolates were used for biochemical identification and sensitivity testing (19).

5- Study was conducted in Kassala - Sudan, to examine stigma towards TB patients, a descriptive, cross-sectional study was held in chest department, Kassala Teaching hospital during April to October 2012, 300 co-patients were fully interviewed. Most of the participants were knowledgeable about the infectious nature of TB and route of transmission. Misconception was observed in the causes, symptoms and prevention methods of the disease. Stigmatizing attitude was cleared explained among the participants are 63% and 29.3% are moderate and high stigma respectively 69.7% were avoided the TB patients and (64.3%) were dislike to continue the social relationship. The participants were unwilling to: use the patients' utensils (82.3%), share drinking and food (69.0%), share same place of work (61.0%), even the patients on TB treatment. And also (63.0%) mentioned that they were not allowing marriage of their daughters / sons from a person who cured from TB. Both gender, young age and low level of education are high stigmatizing towards TB patients (32).

6- Epidemiology of tuberculosis study conducted in Eastern Sudan aimed to investigate the epidemiological factors of tuberculosis (TB) in Eastern Sudan, during 2011, sociodemographic and clinical data was retrieved from the database at Kassala hospital, the study found that TB patients were those who had less education, and the infection more likely common among male patients, and the study concluded that intervention from outside the health field in particular awareness of associated risk factors and improvement of the educational level potentially will strengthen TB control (33).

7- A study was conducted in Kassala Sudan in 2016 to study factors contributing to non-compliance with treatment among tuberculosis patients, cross-sectional study with total number of participants mounted to 366 TB patients, registered in Kassala State during 2015 to 2016. The study findings indicated that multiple factors contributed to non-compliance with TB treatment in Kassala State including age, residence, inadequate knowledge about TB (wrongly perceiving feeling better as cure) and low

socioeconomic status (particularly education level and income), most of the defaulters were males, and only 23.3% were females. The study concluded that Non-compliance was found to be mainly due to lack of patient knowledge and awareness about TB and its treatment (wrongly, perceiving feeling better after starting treatment as cure). TB patient education at the start of TB treatment is a crucial step in the management and will enhance patients' knowledge and awareness about TB, its treatment, and mitigate drugs side effects and minimize early default. Also, TB patients aged 40 years and above, and those living in rural areas who were at higher risk of default, should have more focused activities to keep their compliance to the treatment. TB patients of low socioeconomic status (i.e. those with education level below secondary school and low income) should be provided with more focused supervision, health education and support to enhance their compliance (34).

8- There an analytical cross-sectional study conducted in Wadimadani locality, Central State, Sudan, to determine the prevalence of tuberculosis infection and risk factors for tuberculosis infection among household contacts HHCs between November 2015 and April 2016. To confirm TB diagnosis, all suspect contacts were tested through sputum samples, tuberculin skin test or chest X-ray. Structured questionnaire was used to collect socio-demographic and environmental factors, 146 patients of smear-positive pulmonary tuberculosis were included in the study, 657 household contacts were identified and screened, 43 new TB cases were detected from household contacts, yielding a prevalence of 6.5% (95% CI = 0.05, 0.09) of latent tuberculosis infection (LTBI). Two factors were significantly associated with LTBI among HHCs: duration of contact with a TB patient $\leq$ 4 months (P = 0.03) and the educational status (P = 0.02). and the study concluded that screening of HHCs of index case of TB will contribute in early detection and treatment of new cases, which considered as a forward step towards eliminating TB (35).

2.8.2. Previous studies from the world:

Below is overview of previous relevant studies from other countries:

1. In study conducted in the United States of America USA, a large tuberculosis contact investigation involving Two hospitals — Okaloosa County, Florida, 2014, in total, 244 hospital contacts and seven community contacts were sought for examination. Among 177 contacts from hospital A, and 67 from hospital B, 169 (95%) and 62 (93%), respectively, were tested, or had a documented tuberculosis test with a negative result approximately 12 weeks, after exposure to the suspected source patient. 13 hospital workers (5%) who were no longer employed by the hospitals could not be contacted, despite three attempts by DOH-Okaloosa or hospital personnel. During the hospital A investigation, two additional nurses assigned to the same unit as the original four nurses with TST conversions were found to have positive TST results, bringing the total to 6(3%) conversions among 244 hospital staff members tested from both hospitals. Review of nurse staffing records indicated that the 6 nurses had spent a median duration of 82 hours (range = 12–204 hours) with the suspected source patient at hospital A during November 2013–January 2014; he was presumed to be most infectious early in his hospitalization, before initiation of antibiotic therapy, including levofloxacin. On the basis of the low number of conversions identified at hospital A, and because the conversions occurred only among nurses who had spent extended periods of time in the suspected source patient's room, testing was not expanded to other persons at hospital A. No conversions were identified at hospital B. 3 of 4 roommates of the suspected source patient from both hospitals were tested; all had negative results. One roommate died of other causes. 3 of the 7 community contacts had positive results. One contact received treatment for latent tuberculosis infection, one was treated as a clinical tuberculosis disease case until cultures were reported as negative, and the third contact

was an out-of-state resident with symptoms consistent with tuberculosis disease identified via a phone interview. The appropriate state health agency was notified through an interjurisdictional transfer, which allowed for follow-up by the state of jurisdiction. The DOH-Okaloosa's relationships with the local ICPs were essential for the successful investigation of this cluster. Earlier consideration of tuberculosis might have reduced tuberculosis transmission at hospital A. This investigation highlights the importance of considering tuberculosis in differential diagnoses, even in counties where tuberculosis is uncommon and when patients are admitted for reasons other than tuberculosis, if patients have findings suggestive of tuberculosis, such as pulmonary cavities (36).

2. **In another statistics,** the Centres for Diseases Control and Prevention CDC records in MMWR stated that in 2013, a total of 9,588 new TB cases were reported in the USA, for a rate of 3.0 cases per 100,000. Although the number of TB cases continues to decline, challenges remain that slow progress toward the goal of TB elimination in the United States. TB still persists at greater incidence rates in specific populations. Foreign-born persons and racial/ethnic minorities continue to be affected disproportionately. The TB incidence rate among foreign-born persons in 2013 was approximately 13 times greater than the incidence rate among U.S.-born persons, and the proportion of TB cases occurring in foreign-born persons continues to increase, reaching 64.6% in 2013 (25).
3. A study conducted in the Netherlands; following to the End TB Strategy the Netherlands is aiming to reduce TB incidence by 25% by 5 years, as one of the low-incidence countries. One of the priority actions for low-incidence countries to proceed toward this goal is to have screening programs in place for active TB and latent TB infection (LTBI) in selected high-risk groups, such as asylum seekers from high-incidence countries. Three quarters of tuberculosis (TB) patients in the Netherlands are foreign-born; 26% are from Eritrea or Somalia. The study analysed TB incidence

rates in asylum seekers from Eritrea and Somalia in the first 5 years after arrival in the Netherlands (2013–2017) and performed survival analysis with Cox proportional hazards regression to analyse the effect of age and sex on the risk for TB. TB incidence remained high 5 years after arrival in asylum seekers from Eritrea (309 cases/100,000 person-years) and Somalia (81 cases/100,000 person-years). Age ≥18 years was associated with a higher risk for TB in asylum seekers from Eritrea (3.4 times higher) and Somalia (3.7 times higher), and male sex was associated with a 1.6 times higher risk for TB in asylum seekers from Eritrea. Screening and treating asylum seekers from high-incidence areas for latent TB infection upon arrival would further reduce TB incidence in the Netherlands (37).

4. In another review study in 201, aimed to study the impact of migration on tuberculosis in the United States, the study sees that, due to greater exposure to Mycobacterium tuberculosis infection before migration, migrants moving to low incidence settings can experience substantially higher tuberculosis (TB) rates than the native-born population. It describes the impact of migration on TB epidemiology in the United States, and how the TB burden differs between US-born and non-US-born populations. The United States has a long history of receiving migrants from other parts of the world, TB among non-US-born individuals represents most new TB cases. Based on an analysis of TB cases among individuals from the top 30 countries of origin in terms of non-US-born TB burden between 2003 and 2015, the review describes how TB risks vary within the non-US-born population according to age, years since entry, entry year, and country of origin. Variation along each of these dimensions is associated with more than 10 fold differences in the risk of developing active TB, and this risk is also positively associated with TB incidence estimates for the country of origin and the composition of the migrant pool in the entry year. Approximately 87 000 lifetime TB cases are predicted for the non-US-born population resident in the United States in 2015, and 5800 lifetime cases

for the population entering the United States in 2015. In this review also mentioned that in European settings, higher TB incidence has been observed among undocumented migrants than legal immigrants. In this review also in the United States, a multisite study of individuals newly diagnosed with TB found that 61% of non-US-born individuals were legal permanent residents, 3% had temporary visas, and 25% were undocumented. A study estimating the distribution of TB cases among legal entrants, 1 year since arrival based on TB incidence in the country of origin found that 42% of cases occurred among legal immigrants, and 58% among short-term non-immigrant visitors. These studies use data collected during 2000 – 2008. Country of origin will also influence TB outcomes in the United States and is routinely reported for incident TB cases. TB case data were drawn from the National TB Surveillance System (NTSS), and population estimates calculated from American Community Survey data. Taken together, individuals from these countries represented 73% of all non-US-born TB cases over the period shown, and 43% of all TB cases, irrespective of nativity. Panel A shows differences in TB incidence attributable to age. Non-US-born individuals aged 2–12years experienced the lowest TB risk, with adjusted IRRs, 0.2 compared to population-average incidence for non-US-born individuals. Older age groups log link function, which assumes the different predictors interact multiplicatively (38).

5. It is known that factors such as overcrowding and malnutrition have an important impact in the epidemiology of tuberculosis (TB), especially in developing countries. There have been also some studies demonstrating the association between climatic factors and the seasonal variability of TB, however, there is a lack of studies on this topic. Climate phenomena such as El Ni˜no Southern Oscillation (ENSO) affects climatic variables, promoting of the transmission of infectious diseases in Peru and other countries of the region, particularly vector-borne diseases. Therefore, study

assessed if there is an association between ENSO phenomena and the incidence of TB in a large hospital in Lima, Peru, over a 4-year period. Study performed an ecological analysis in which the relationship between the number of monthly cases of TB and climatic variables from the National Oceanographic and Atmospheric Agency (NOAA) was assessed. ENSO was measured by the Oceanic Ni˜noIndex (ONI), which is the monthly average of climatic anomalies in the sea surface temperature, expressed in ◦C, in the El Ni˜noregion [5◦N–5◦S,120◦–170◦W]. Non-linear regression models were run for these variables. Stata was used, significance level $p < 0.05$.A total of 2162 cases were diagnosed during the study period(36/month), 56.5% of which corresponded to pulmonary tuberculosis. In the simple nonlinear regressions, significant associations were observed between ONI ($r2= 0.9495$; $p < 0.0001$) and TB incidence. Furthermore, a greater number of cases of TB were evidenced when the ONI index had values below 0.5◦C (La Ni˜na'sphenomenon). Additionally, the association between pulmonary TB (TBP)$r2= 0.9081$ ($p < 0.0001$) and extra pulmonary TB (TBEP) $r2= 0.9250$($p < 0.0001$) with ONI was very significant. The inversely proportional relation for the case of the TBP with the ONI could be due to its aerial transmission, which makes it more susceptible to the influence of the climate. Although there is a high incidence of TB worldwide, while not found previous studies associating ENSO with the incidence of TB. The findings of this preliminary study show the impact of climate change on the epidemiology of TB, which could contribute to the execution of preventive actions, control and seasonal diagnosis of TB. It is required the execution of additional studies for the confirmation and validation of these results (39).

6. There a review study related to climate aimed to illustrate the effect of altitude and temperature on TB notification rate. Electronic searches were undertaken from PubMed, EMBASE, and Scopus databases. A review was performed using the Meta-analysis Of Observational Studies in

Epidemiology guideline. Therefore**,** nine articles from various geographic regions were included in the study. Five out of 9 studies showed the effect of altitude and 4 articles identified temperature effects. Results showed that TB notification rates were lower at higher altitude and higher at a higher temperature. This review provides qualitative evidence that TB notification rates increase with temperature and decrease with altitude. The findings encouraged policymakers and program managers to consider seasonality and altitude differences in the design and implementation of TB prevention and control strategies (40).

7. A study conducted to evaluate The End TB Strategy; It is known that World Health Organization (WHO) initiative, The End Tuberculosis Strategy, sets ambitious targets for 2020–2035, including 20% reduction in TB incidence and 35% reduction in the absolute number of TB deaths by 2020 and 90% reduction in TB incidence and 95% reduction in TB deaths by 2035, compared with 2015 (41). A study evaluated the global (194 member states) progress toward these targets based on data reported by WHO, in 2018, an estimated 10 million persons had incident TB, and 1.5 million TB-related deaths occurred, representing 2% and 5% declines from 2017, respectively. However, to meet the global targets for 2035, more intensive efforts are needed by public health partners to decrease TB incidence and deaths, and increase the number of persons receiving TB curative and preventive treatment. Innovative approaches to case finding, scale-up of TB preventive treatment, use of newer TB treatment regimens, and prevention & control of HIV will contribute to decreasing TB (42).
8. Persons experiencing homelessness also present a challenge for TB control. A study in USA showed result that during 2006–2010, the TB rate among persons experiencing homelessness was estimated to be 36–47 per 100,000 populations, approximately 10 times greater than the overall national TB incidence during that period (43).

9. In evaluation study for TB risk factors conducted in Minneapolis, Minnesota USA, it stated that Tuberculosis (TB) is a greater risk for populations experiencing homelessness PEH. When a TB exposure occurs in a homeless shelter, evaluation of contacts is both urgent and challenging. In 2017, local public health workers initiated a response to a TB outbreak in homeless shelters in Minneapolis, Minnesota, USA. In this contact investigation, multiple techniques incorporated to identify, evaluate, and manage patients, including the concentric-circle method to characterize amount of contact, identifying the most frequent sites of sporadic medical care, using electronic medical records, and engaging with medical providers treating this population. Of 298 contacts evaluated, 41 (14%) had latent TB infection and 2 had active TB disease. The analysis indicated a significant relationship between duration of exposure and positive TB test result ($p = 0.001$). So study encouraged local public health departments to expand beyond the traditional contact tracing techniques by leveraging partnerships and existing systems to reach contacts exposed in shelters. And this review showed that the incidence of TB in PEH populations is >10 times that of the general population (i.e., 36–47 vs. 2.8 cases/100,000 population during 2006–2010) because risk factors, such as HIV infection, mental illness, substance abuse, and barriers to accessing healthcare, put them at higher risk. In addition, PEH often use homeless shelters, and congregate in environments where the risk for TB transmission is greatly increased in 2017, a total of 70 cases of TB were diagnosed in Hennepin County, the largest county in Minnesota, USA (population of 1.3 million). This area has experienced an ongoing cluster of genotypically linked TB cases among long-term PEH (44).
10. A descriptive, retrospective, multi-center observational study of new TB cases conducted in different regions in Spain between 2006 and 2014. Used logistic regression and calculated odd ratios (OR) and 95% CI to determine EPTB-associated factors. It was found that the proportion of EPTB were

higher among the foreign-born population 22.1% than among native Spaniards (15.9%; p = 0.001). Foreign cases were mostly Asian, with up to 42.8% of India and Pakistan cases showing some form of EPTB. The factors related were immigrant status (OR:1.62; CI:1.35–1.95); age >50 years; (OR:1.70; CI:1.36–2.13); diagnosis delay of >51 days (OR:1.38; CI:1.17–1.62); co-infection with HIV (OR:1.77; CI:1.21–2.55); negative smear sputum microscopy (OR:3.01; CI:2.50;3.61); negative culture; (OR:8.1; CI:6.57–10.02); poor clinical progression during disease progression (OR:2.93; CI:1.30–6.39). The study recommended main measures required include increased clinical suspicion and improved microbiological diagnosis to support earlier and adequate treatment (45)

11. Research considers some diseases as risk factors for TB prevalence rate. Study conducted in Patients of active / quiescent tuberculosis who presented to Department of Tuberculosis and Chest Diseases, Government Medical College, Patiala, Punjab, India, with complaints of breathlessness and had rhonchi on examination were subjected to bronchodilator reversibility testing to prove if they were suffering from concomitant asthma, it resulted that for over 6 months, 69 patients of tuberculosis along with asthma were found. Only 21/69 (30.4%) patients developed tuberculosis after asthma. 48/69 (69.6%) patients developed asthma after tuberculosis. Majority (25/48=52.1%) of them developed asthma within 5 years of completion of ATT (p=0.020). Only 2/48 (2.9%) patients had a positive family history for asthma. Lung function abnormalities correlated with the extent of radiological involvement in these patients who developed asthma after tuberculosis ($p \leq 0.0001$) (46).
12. A community based cross-sectional study conducted in Hamaraya to assess the prevalence and associated factors of tuberculosis among adult household contacts of smear positive pulmonary tuberculosis in Haramaya district, Oromia Region, Eastern Ethiopia 2019. for 454 study participants for all adult household contacts of smear positive pulmonary tuberculosis

patients treated from July 2017 to December 2018, the overall prevalence of pulmonary tuberculosis among adult household contacts was 7.8% (95% CI: 5.8–10.0). The risk factors for tuberculosis infection among household contacts were eating meals less than three times per day (AOR = 4.31; 95% CI: 1.61, 11.55), drinking raw milk (AOR = 4.12; 95% CI: 1.43, 11.90), having family history of tuberculosis with more than one index case (AOR = 2.7; 95% CI: 1.02, 6.92), living in poor ventilated houses (AOR = 4.02; 95% CI: 1.38, 11.76), and living in inadequate size of living room (AOR = 3.4; 95% CI: 1.30, 8.86) (47).

13. Across section health facility-based study conducted in Merhabete district, Central Ethiopia, Dec 2019 to June 2020, study is aimed at assessing the prevalence of pulmonary TB (PTB) and the development of drug resistance using GeneXpert MTB/RIF assay; 161 presumptive TB patients participated, with a response rate of 89.5%. The overall prevalence rates of PTB and RR M. tuberculosis were 11.2% and 15.8%, respectively. The average age of the participants was 45.7 years, of whom 53 (31.0%) were allocated to the age group from 49 to 64 years. Males were more frequent (110, or 64.3%) than females. About 30% (51/170) of the respondents had no formal education (48).
14. A mixed methods study conducted from October to November 2017 in the nine Challenge TB–supported regions of Ethiopia, to surveying Stigma matters in ending TB; countrywide survey of stigma in Ethiopia, using multistage cluster sampling to identify 32 districts and 8 sub-cities, from which 40 health centres were randomly selected. 21 TB patients and 21 family members were enrolled from each health center, and 11 HH members from each community in the catchment population. The study concluded that More than a third of Ethiopians have high scores for TB-related stigma, which were associated with educational status, poverty, and lack of awareness about TB. Stigma matters in TB prevention, care, and treatment and warrants stigma reduction interventions (49).

Chapter Three: Materials and Methods (Methodology)

3.1. Study design and setting

3.2. Study area

3.3. Study populations

3.4. Sample size and sample techniques

3.5. Data collection and tools of data collection

3.6. Data analysis and presentation

3.7. Interventions

3.8. Research Ethics Considerations

3.9. Study limitations

3. Materials and Methods (Methodology):

3.1. Study design and setting:

A community-based descriptive cross-sectional study to know the epidemiology of tuberculosis among Alsalam IDPs camp 2019 – 2021.

The research aims to measure the prevalence of tuberculosis and look for the risk factors associated with the disease prevalence as well as to assess the effectiveness of TB program interventions including health education, behaviors; Knowledge Attitudes and Practices to the prevalence of tuberculosis among the IDPs in Alsalam camp.

The researcher conducted a survey at the beginning of the study period as baseline to see the situation against the study's objectives, data was collected on November 2020 from the results of the first part of the study, recommendations related to TB program interventions been adjusted and implemented to see the intended improvement. Same study repeated on November 2021 to see the epidemiology if the situation (prevalence) regarding tuberculosis changed to positive, negative or remains as it is and to look for the deference's and why.

Interventions took place after the first part of the study following the outcome and the recommendations, it included health education to raise the awareness of the community regarding tuberculosis, advocated for stigma and TB program support at camp level; the interventions are in line with Sudan NTP program guidelines and protocol, supporting advocacy and communication strategy. The health education using NTP messages, materials, guidelines and other tools, strategies, and methods those recommended by the FMoH and other national and international partners to use in country to combat TB. The usual TB interventions to support case detection and treatment are the community outreach like house-to-house screening, community mobilization, TB education using different means of raising community awareness, posters, patient's education, school messages, train community health worker's community mobilization, community leaders

and guide for free diagnosis and treatment etc. Detailed interventions have been put under (3.8. Interventions).

3.2. Study area:

The study area is Alsalam IDPs camp; the camp located in South Darfur state Beliel Locality near to Nyala town; the state total population is 5,395,940 (50). This population figure ranks the state the second among other states after the capital of Sudan Khartoum. The camp located 7 kilometers South Nyala town in separated area from the town, Alsalam camp founded in 2004 the population count 118,984 internally displaced persons ≈ (19,831 households) organized in ten sectors, the camp has three Primary Health Care Centers operated by NGOs with support from State Ministry of Health and UN agencies; two of health centers operated by International Medical Corp IMC and one operated by Care International Organization. These clinics provide PHC services, nutrition, reproductive health, EPI, Health education, medical consultation and treatment, there was one TBMU in Care International PHC center with lab, pharmacy and consultation, with staff of lab technician and medical assistant, the TB service was available free of charge with support from the state ministry of health NTP program, the services resumed work on December 2017, it had been out of services for more than two years, although the service still not stable.

3.3. Study population:

The study targets all population (IDPs) in Alsalam camp the sample selected to represent all 10 sectors within the camp; to cover the sample, the study interviews one person from selected household, the selected person either male or female, head of household or other member of the household must however be permanent residents in the camp and aged more than 15 able to answer interview questions. If there are more than one person at the household has TB, or suspected TB, this considered and adjusted accordingly to measure the prevalence rate of the disease. The study also targeting state TB program; the TB coordinator at the state level

and health personnel in Alsalam camp TBMU information been collected from them through interview and the checklist.

3.4. Sample size and sample techniques:

The required sample size calculated by the following formula:

$\mathbf{N = \frac{z^2\,(p.q)}{d^2}}$, where;

N ≡ sample size,

Z ≡ the standard normal deviate = 2, at 95% confidence level,

p ≡ prevalence (the estimated proportion of a particular characteristic in the target population; proportion of the target population with tuberculosis the proportion is unknown p = 0.5 (50%),

q ≡ None expected prevalence, = (1.0 – p),

d ≡ the allowed error or degree of accuracy desired = 0.05, (51).

The sample techniques that the study follows; camp's population originally divided into ten clusters numbered from 1 to 10, clusters nearly in equal sizes. Sample size (HHs) divided by the number of sectors in the first part of the study as well as in the second part, to determine the number of households to be selected from each cluster, the household from each cluster chose by simple random sampling, to determining the interval of selection divide the cluster size by the number of households those supposed to be chose from the cluster, one person interviewed from the selected household and ask if there a suspected TB in the family or being under treatment with other questions in the questionnaire.

Following to the given formula the sample size calculated as follow for each round of the study:

$N = \frac{z^2\,(p.q)}{d^2}$, $= \frac{2^2\,(0.5.0.5)}{0.05^2}$, $= \frac{4\,(0.25)}{0.0025}$, $= \frac{1}{0.0025}$, so the samples size, N = 400 households,

To determine the number of households to be selected from each cluster; sample size (400 HHs) divided by the cluster sample (10) = $\frac{400\ \text{HHs}}{10}$ = 40 HHs from each of the ten clusters, although in the first part of the study covered 401 HHs and the

second part of the study covered 398 HHs, the total HHs surveyed in this research are 799. Sector households' number is different than what planned as there high absents of HHs during the survey; so to cover the sample size taken more or less than 40 HHs per sector.

3.5. Data collection and Tools:

Various means of data collection used for deference sources; pre – visits have taken place to identify the study area and to get information about groups, medical and health services, nutrition and geographical area.

1. **Questionnaire:** Considered a main tool for data collection in this study, it is a closed questionnaire, includes four parts; consent & permission, Demographic information (basic information), Knowledge attitude, practice (behaviour) including other factors and last part for TB prevalence which includes suspected cases and lab test, questionnaire listed number 1 under appendixes. The questionnaire, used to interviewing one person from each selected household, the questionnaire contains important points of tuberculosis prevalence and associated risk factors including behaviour; the questionnaire starts with the consent paragraph, the socio – demographic profile of interviewees, part of behaviour, other risk factors and then the last section for TB status (test for suspected cases). Suspected cases identified during interview; interviewee asked about the signs and symptoms then sends to lab for confirmation. Pre-test for the main tool (questionnaire) conducted, the same tools used again during the second round of the study, as longer as nothing to be adjusted during the second part of the study.
2. **Key Informant Interview KII**: Key Informant Interview questions structured in one document and used during the interview with key persons, it had been taken with TB coordinator at the state level and with the health personnel in Alsalam camp TBMU, KII listed number 3 under appendixes.

3. **Checklist:** Checklist is a tool used during the research to collect relevant observed information from the camp and Health Facilities in the camp, all points related to observations listed in one document to recall and for documentations, checklist form listed number 2 under Appendixes. The study used secondary Data from the state TB program as well as observation during the study period, interviews with health services providers for triangulations of the research findings,
4. **Laboratory Test for suspected cases:** During the interview ask for signs and symptoms of TB, to detect all HH suspected cases and send for TB test during the two rounds of the study. Zihl Nelson Stain method test performed for sputum to confirm suspected case, sputum sample have been collected from each suspected case, use sputum container, it taken at morning two sample for two consecutive days, sample dropped on clean slide prepared in slide glass and air dried for several minutes, then fermented with carbolfuchsin for 7 – 10 minutes, slides passed through fire flame until the appearance of vapor, then washed with water, acid alcohol added for few seconds for dimming, then wash it again with water and add methylene blue for one minute, washed for third time with water, then put at draying rack for air dry, eventually slide be ready to read the result under microscope objective lense X100, to see the result and take the record as smear-positive or smear-negative (52), (53), (54), (55), (56), (57).

   As there a specific lab for TB with specific standards with trained lab technicians who able to process TB test, Alsalam clinic lab was not functioning during the first part of the study, qualified and trained lab specialist in TB has hired and did the tests in Alsalam camp to the suspected cases. While in the second round of the study lab was functioning and did the test in Alsalam TBMU. Results from the two studies followed, received later, and analysed with other data. In total there 44 suspected cases tested for the two studies; in the first-round study there were 17 suspected cases sent to lab for sample confirmation, with their names, code or contact taken

for follow up the results, result followed and received later and analysed with other data, there were 9 positive cases while in the second round study there were 27 suspected cases sent to lab for sample confirmation, with their names, code or contact taken for follow up the results, and there no positive case.

5. **KoBo toolbox:** It is an electronic Program KoBo Toolbox application in mobile phone – android used for data collection; KoBo Toolbox is a suite of tools for field data collection and analysis for use in challenging environments, KoBo Toolbox developed by the Harvard Humanitarian Initiative it is free and open-source software, mostly used by workers in humanitarian crisis, aid professionals and researchers in developing countries (58). Researcher created an account, questionnaire has been defined in the system, data entered directly during the interview and uploaded to drive with the internet so easily transfer data to one centered point then through excel sheet be transferred for the further analysis, using SPSS. Researcher defined the questionnaire in Kobo toolbox, enumerators have been trained for one day in data collection, the questionnaire and how to work with KoBo toolbox, pre-test have taken place to ensure data can be collected and generated from KoBo toolbox account.

3.6. Data Analysis and Presentation:

In addition to the KoBo Toolbox, program uses the statistical program for social sciences (SPSS) computer package version no 22.0 (59), data collected through KoBo toolbox and excel sheet generated from the account after data collection, then pasted to designed SPSS program for further statistical analysis, tables, graphs and figures adjusted using different programs.

Study proposal presented in March 2019 to the university of Shendi High Studies panel, the proposal had been accepted, the first round of the study result was presented and discussed with supervisor. One paper has been published, and the second round of the study included in this final report it compares the two rounds

following the research objectives. Research report follows University of Shendi guidelines and PhD requirement. Research results presented in Tables, Figures, narrative report, and maps.

3.7. Interventions:

Following to the study design, the implementation planned to be after the first part of the study findings. The following recommendations are the activities been implemented before the second part of the study:

- Researcher has advocated and lobbied to have TB centre with trained staff to reactivate Alsalam **PHCC** TBMU through the following:
- Communicated with TB program, Care International and field staff at Alsalam PHCC, linked them challenges discussed, the way forward and follow the actions until the center been reactivated by mid October 2021.
- Staff trained on the updated protocol include the recruitment of Lab specialist; **Organization CI**; continued paying the incentive for staff, run the HF, transport TB supply to Alsalam camp PHCC TBMU, also intensified integrated-health education activities in the clinic and WASH sector at the community.
- Program provided anti TB drugs and Lab supplies to Alsalam TBMU; **TB coordinator**, was provided the essential supply to the clinic; include anti TB, lab supply, seconded lab specialist, initiated training for staff in new protocol,
- Liaised with CARE International WASH sector and other INGOs in Alsalam to include TB education through health education sessions at the centre like other diseases, this includes other 2 PHCCs
- Researcher worked with other PHCCs at the camp and private clinics to refer suspected TB cases to the center and disseminated messages that the TB center is activated
- Work at **community** level:

- TB awareness messages included with WASH messages and other general health education at the camp level through community volunteers and PHCCs staff.
- One-days training sessions to 32 community volunteers on TB topics on (basic knowledge, and updated information about TB, TB at camp, research findings, barriers, referral of suspected TB cases, etc).
- One day Mobile health education campaign use megaphone; conducted a campaign to raise community awareness to know TB signs, symptoms, TBMU and the free services available; diagnosis and treatment at the camp

- **Researcher:** Followed up of interventions, met with Director General discussed, research findings, the support of TB program at the state level with mentioning challenges faced by the TB program; the issues mentioned such as; there is no local or government financial support, no incentive to staff this resulted into the interruption of the service, staff stigma, no attractive environment, the program has no mean for transportation, these resulted in to inaccessibility to reach some areas at the state level, lack of cooperation from some INGOs and they consider TB is supported by the global fund so they do not support it following to some donor restrictions and regulations, poor office infrastructure no separate office for TB at the state SMoH office, TB is communicable disease it is risky compared to other diseases, so the salary and the incentive is not enough,

3.8. Research Ethics Considerations:

The study has no trial or direct intervention to man; or any intervention can touch the human physically, consideration taken to not violate human dignity, research ethics have been considered, below are consideration for research ethics:

- **Official documents** have issued from the university indicated the purpose of this study, copies used to communicate government authorities, camp management and community, documents used to have local permission for movement and looking support, accordingly other permissions have

granted from state Humanitarian Aid Commission HAC and from State Ministry of Health SMoH as well as verbal permission from camp management and organizations operating programs in the area.

- **Meetings** held with all related authorities including community leaders before the start-up of the work.
- **Consent:** Introduction with written consent note read before any interview, for every interviewee and ask them before the interview, told them that information will be treated confidentially, no name will be taken or written, the test result will not be shared with any person until come back and no names will be written in the questionnaire.
- **Patient Confidentiality:** Patients with signs and symptoms; suspected need to have special further consideration; counselling to be done for them, which guides them with further information about the lab test where it available. Further information to be collected with confidentiality like name, contact or code to follow to know and share test results.
- For the testing process, ensured to use SMoH staff for testing who are well trained and specified personnel dealing with TB patients.
- Information from the record in the clinic have been taken without names.
- **Trained Team:** Team of data collection, received a training; well trained in basic interview techniques and the questionnaire, KoBo Toolbox through mobile android, how to use the app, interviewing and answer directly to the device - phone or tablet the process needs specific techniques, they trained to adhere to the Sudanese culture with full respect during the visit to the selected HHs, like permission; nocking the door and greetings have to be followed according to social culture, considering the COVID-19 prevention measures. The enumerator should read the consent to the participant, take permission, and ask everyone before the interview to show their interest, answer and cooperate in this research study.
- Interventions were according to NTP activities followed the routine programs those SMoH supposed to implement.

3.9. Limitations of the study:

- Seasonality had affected the HHs presence, by the end of the year November to December, is a harvesting season, majority of people were for the harvest during the study time, interviewed people likely were not HH decision makers or with less information to represent the HH. This also affected the sample size and to apply sample techniques as planned. In some sectors the team did a total coverage, to complete the sample.
- The family monthly income was excluded from the results generally due to unstable prices and high inflation during the study period. It is one of the important socioeconomic factors related to TB from previous studies, the study faced limitations to measure its impact on TB prevalence, it was difficult to calculate the monthly income following the ranges that set earlier in the study proposal. Additionally, in the KII there were many challenges managerial, logistical and financial, have been mentioned by the TB Coordinator at the state level, no information to confirm challenges are affecting the TB prevalence directly or indirectly.
- The network was bad in the camp, this affected the study like in suspected case follow up, link up positive case with health providers and the contact tracing, the GPS coordinate appeared in KoBo map is not accurate.
- Although previous studies consider some characteristics as risk factor influence TB prevalence this have not been confirmed in the 1st part of the study or are not significant. These factors include age group, marital status, gender, education level, occupation, family monthly income, and Family HH head. While no positive TB cases in the second part of the study and accordingly no more information to look for any corelation.
- COVID-19 pandemic affected the movement of team in addition to the demonstration and road blocking affected the travel many times; though the interventions were not very affective because had not been implemented as planned.

Chapter Four: Results

4.1. Results from the questionnaire

4.2. Checklist Results

4.3. Results from the Key Informant Interview

4. Results of The Study

4.1. Results from the questionnaire:

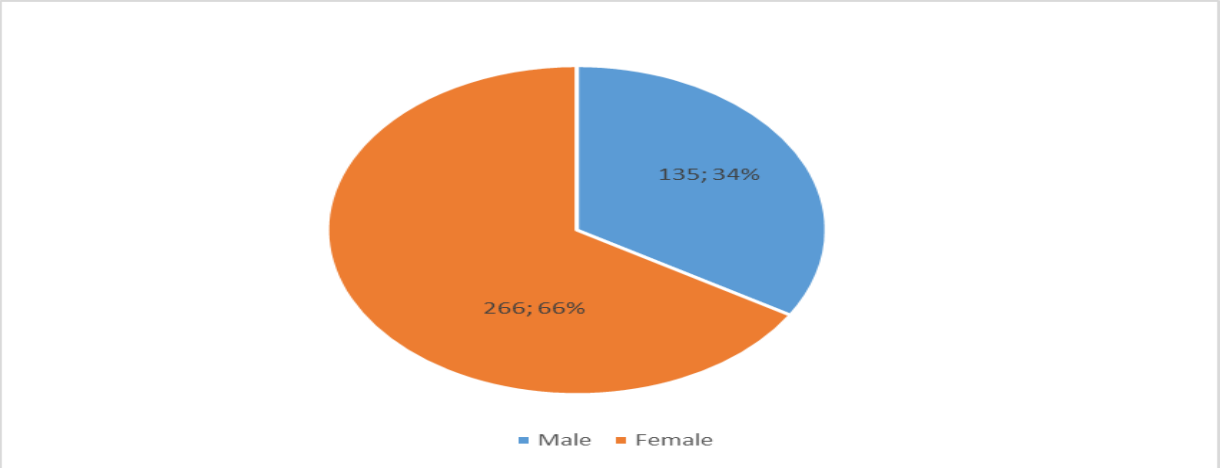

Figure 1.1: Gender of household member who interviewed at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

Out of 401 HHs, 34% (135) males members interviewed, while females were represented the greater number of interviewees 66% (266).

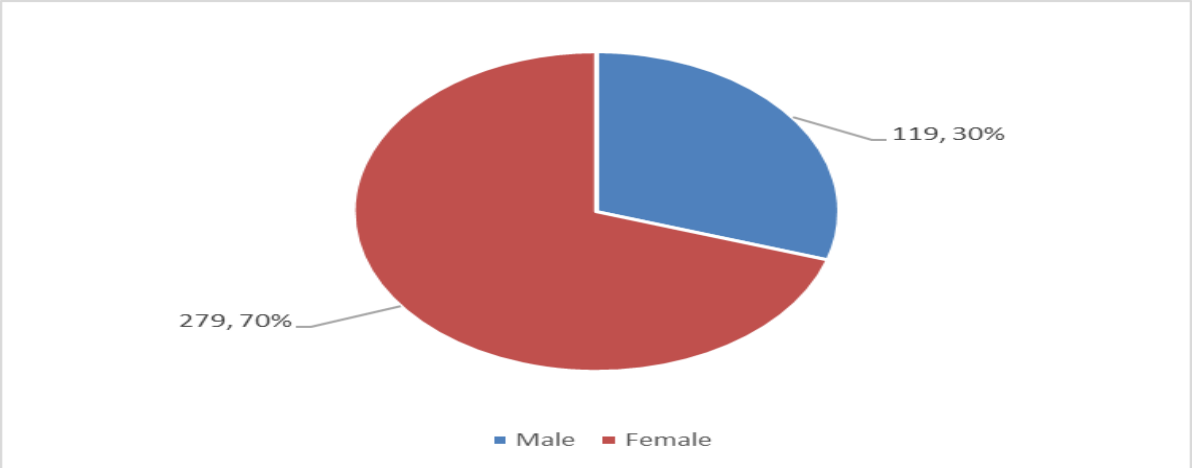

Figure 1.2: Gender of household member who were interviewed at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

Out of 399 HHs, 30% (119) males members interviewed, while females were represented the greater number of interviewees 70% (179).

Comparison: In both studies females represent a greater number of participants while there a 4% different; male participants decreased in the second part of the study.

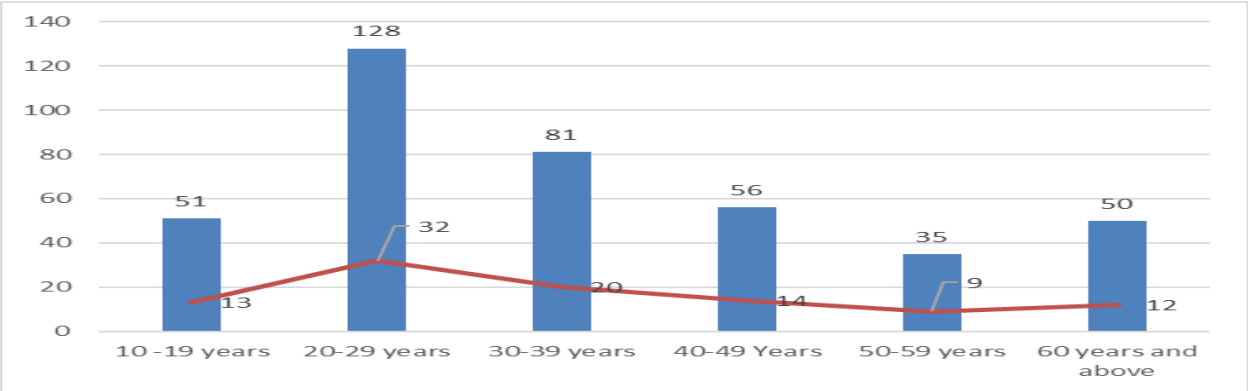

Figure 2.1: Age group of HH member who were interviewed during the study at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

The distribution of age of sample among HHs` studied members; participants aged 10 -19 years, represent 12.7% (51). The participants from 20 – 29 years show 31.9% (128). Participants from 30 - 39 years show 20.2% (81). Interviewees from 40 – 49 years signify 14% (56). He household members from 50 – 59 years imply 8.7% (35). While participants aged 60 or above represented 12.5% (50).

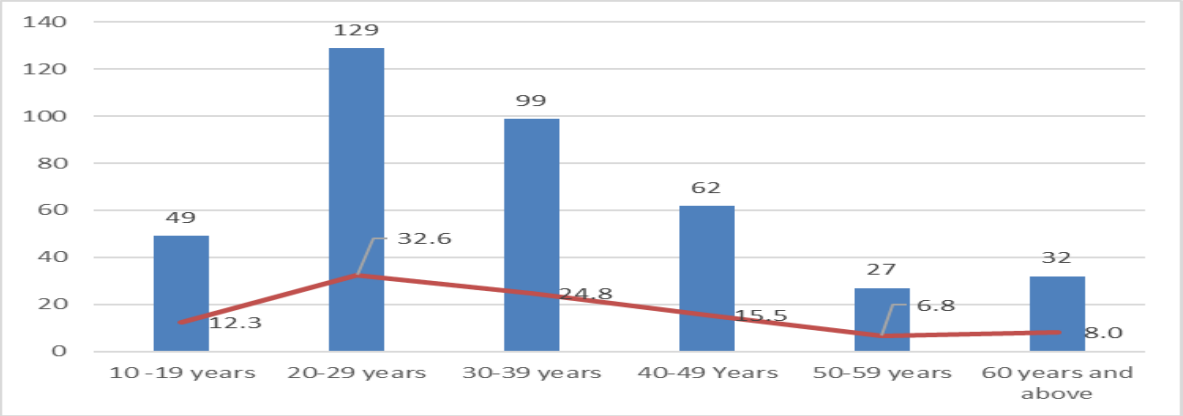

Figure 2.2: Age group of household member who interviewed during the study at the Alsalam IDPs camp, SD, November 2021, N = 398.

Ages distribution among HHs` studied members at Alsalam, participants aged 10 -19 years, represent 12.3% (49). The participants from 20 – 29 years show 32.6% (129). Participants from 30 - 39 years show 24.8% (99). Interviewees from 40 – 49 years signify 15.5% (62). Household members from 50 – 59 years imply 6.8% (27). While participants aged 60 or above represented 8% (32).

Comparison: No notable difference observed between the two studies.

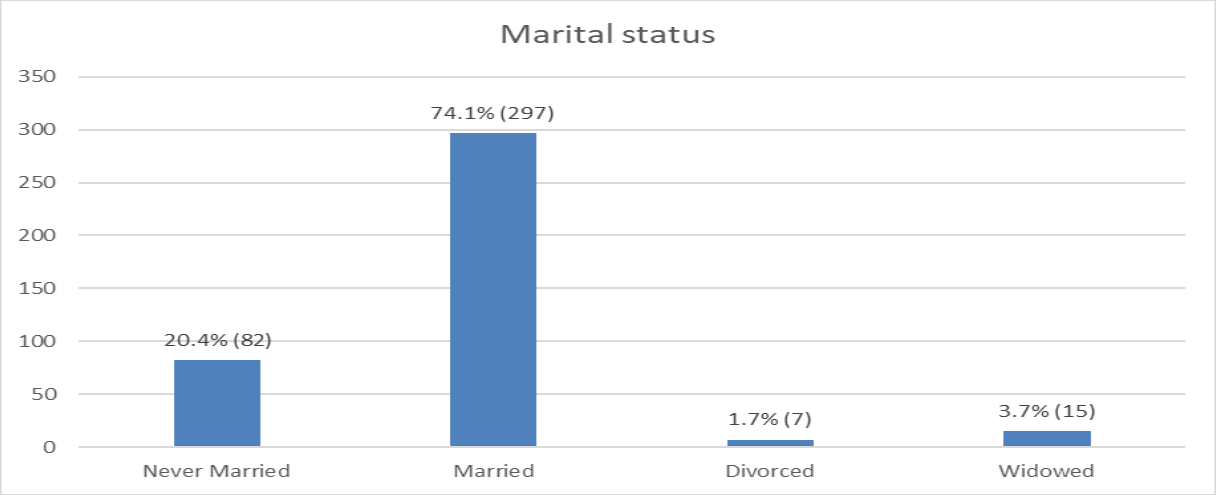

Figure 3.1: Marital status of HH member who was interviewed during the study at the Alsalam IDPs camp, SD State, November 2020, N = 401.

Out of 401 study participants 20.4% (82) of them never married, the greater percentage 74.1% (297) were married, while 1.7% (7) divorced. And widowed participants represented 3.7% (15).

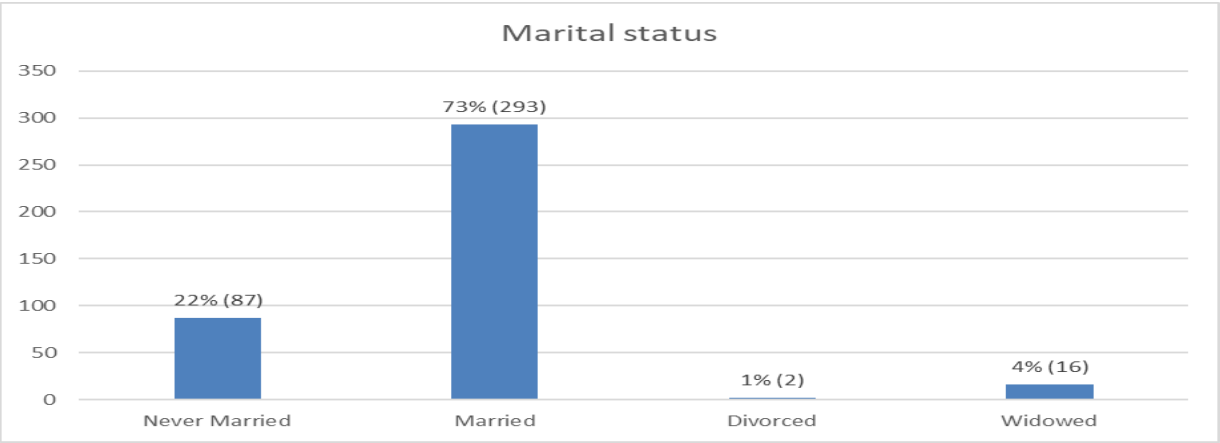

Figure 3.2: Marital status of the HH member who was interviewed during the study at Alsalam IDPs camp, SD State, November 2021, N = 398.

Out of 399 study participants 22% (87) of them never married, the greater percentage 73% (293) were married, while 1% (3) divorced. And widowed participants represented 4% (16).

Comparison: No notable difference appeared between the two studies.

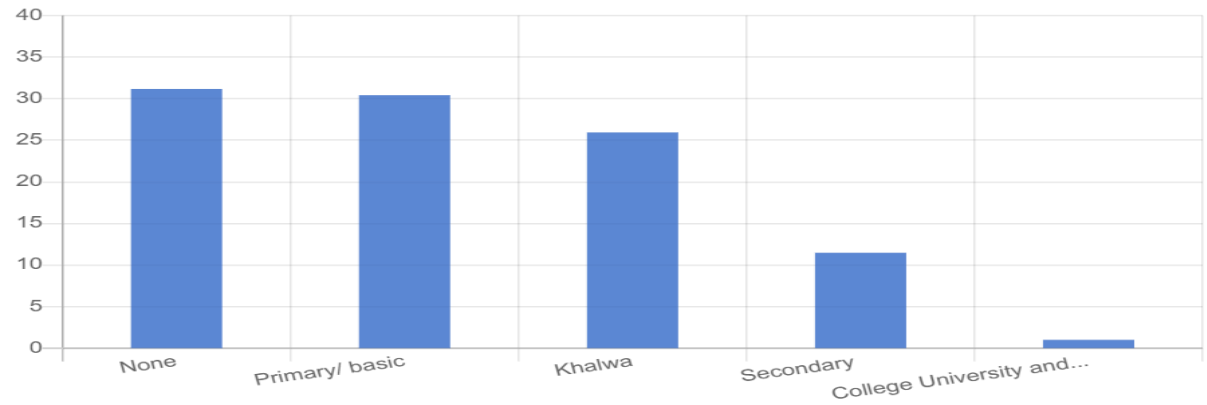

Figure 4.1: Education level for participants who were interviewed during the study at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

The illiterate or who did not attend any education (none) were 31.2% (125), followed by those who attended or completed basic / primary level school 30.4% (122), followed by the participants who attended Khalwa represented 25.5% (104), then the secondary school level 11.4% (46), and finally the less percentage; only 1% (4) for those who have finished college, university level or above.

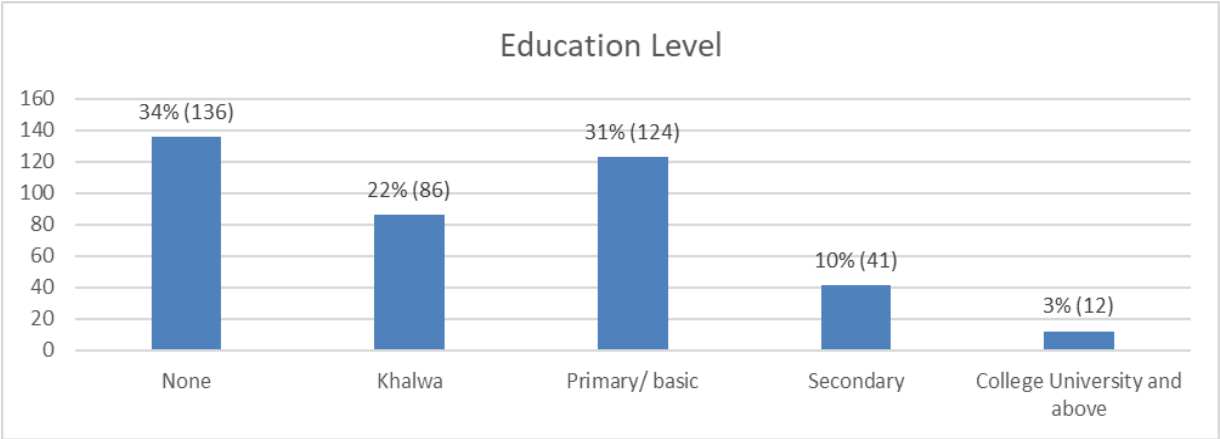

Figure 4.2: Education level for participants who were interviewed during the study at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

The illiterate or who did not attend any education (none) were 34% (136), followed by those attended or completed basic / primary level school at 31% (124), followed by the participants attended Khalwa represented 22% (86), then secondary school level 10% (41), and finally the less percentage; only 3% (12) for those who have finished college, university level or above.

Comparison: It observed increase in the level those who finished college or university compared to the first part of the study in other sectors.

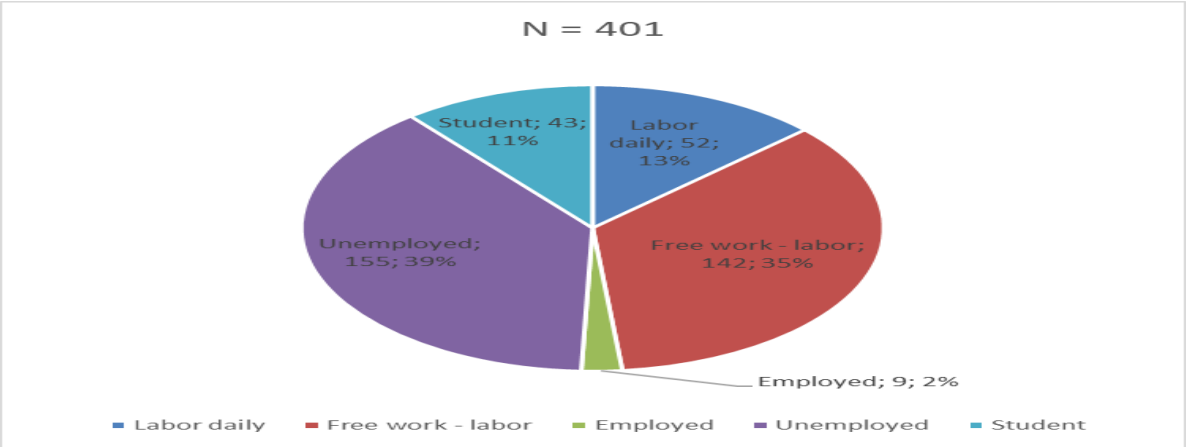

Figure 5.1: Occupation of the participants represented households to the study at Alsalam IDPs camp, South Darfur State, November 2020.

Unemployed (none workers) represented 39% (155) followed by (unskilled labors) free labors 35% (142), daily labors 13% (52), while 11% (43) of the participant were students represented their HHs and the least percentage under employees 2% (9) only.

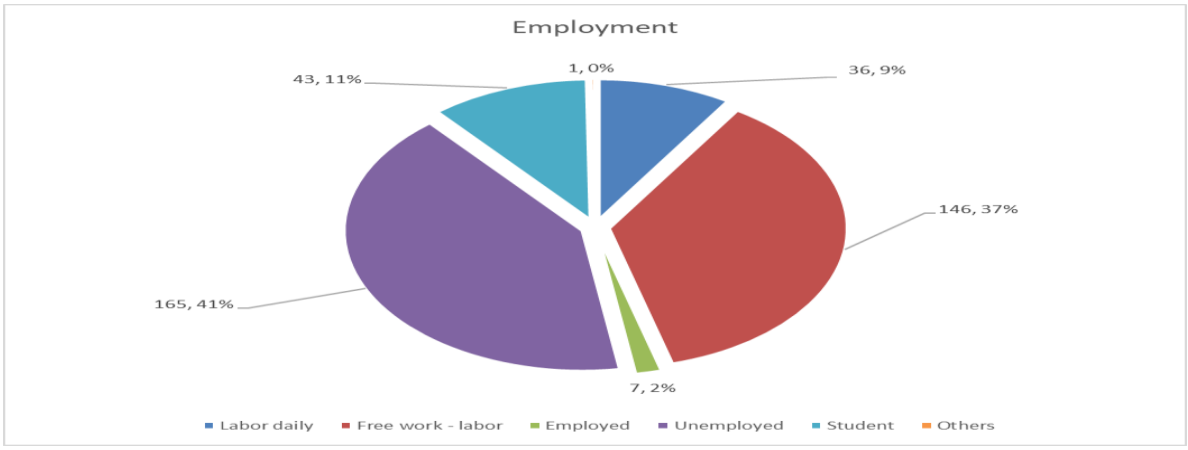

Figure 5.2: Occupation of the participants represented households in the study at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

Unemployed (none workers) represented 41% (165) followed by (unskilled labors) free labors 37% (146), student represented their HHs 11% (43), while 9% (36) of the participant were daily laborers and the least percentage under employees 2% (7) only.

Comparison: No notable difference was noted between the two studies.

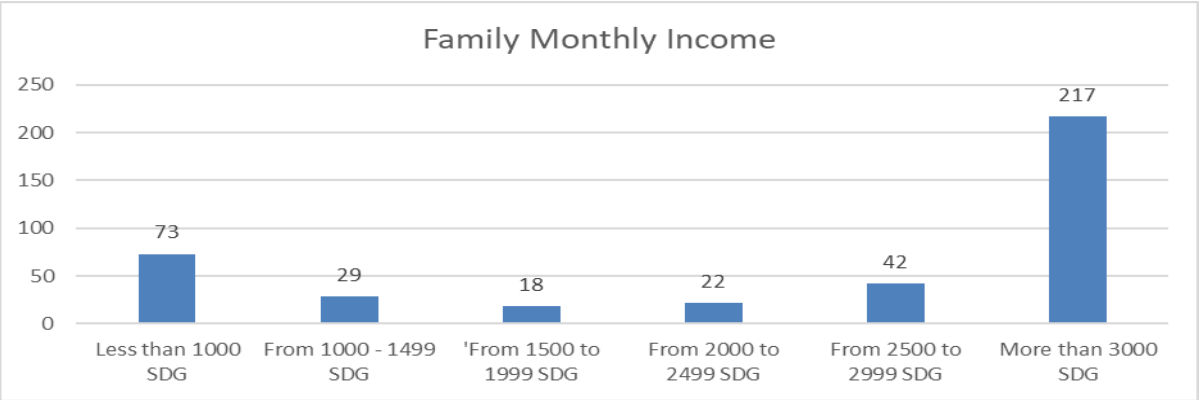

Figure 6.1: Family monthly income in SDG of the household selected for the study at Alsalam IDPs camp, South Darfur State, November 2020.

Family monthly income in SDG at Alsalam IDPs camp; monthly income more than (3000) SDG represented 54.1% (217), less than (1000) SDG were 18.2% (73), followed by 10.5% (42) between (2500 - 2999) SDG, between (1000 - 1499) SDG were 7.2% (29), followed by 5.5% (22) from (2000 to 2499) SDG, and the least percentage was 4.5% (18) for the income range (1500 to 1999) SDG.

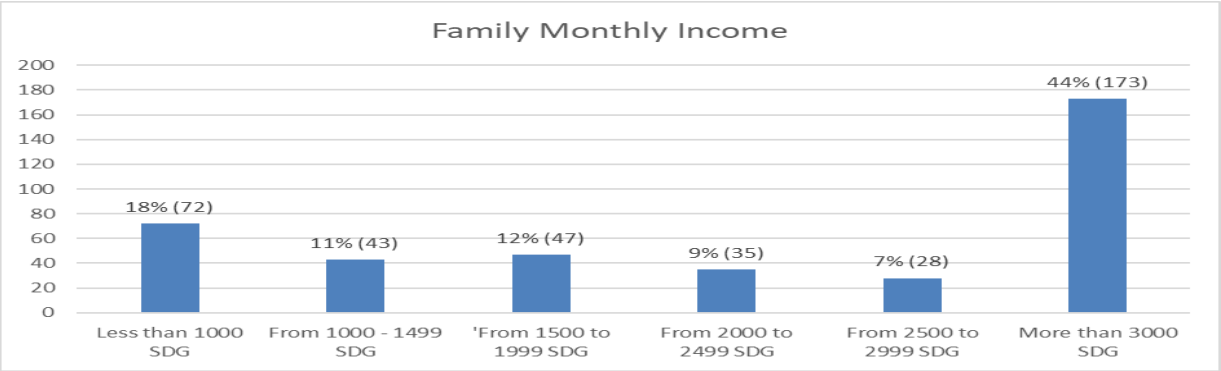

Figure 6.2: Family monthly income in SDG of the household selected for the study at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

Family monthly income in SDG at Alsalam IDPs camp; monthly income more than (3000) SDG represented 44% (173), less than (1000) SDG were 18% (72), followed by 12% (47) for the income range (1500 to 1999) SDG and then those between (1000 - 1499) SDG were 11% (43) and followed by 9% (35) from (2000 to 2499) SDG and the least percentage is 7% (28) between (2500 - 2999) SDG.

Comparison: The monthly income excluded from the results generally due to unstable prices and high inflation during the study period.

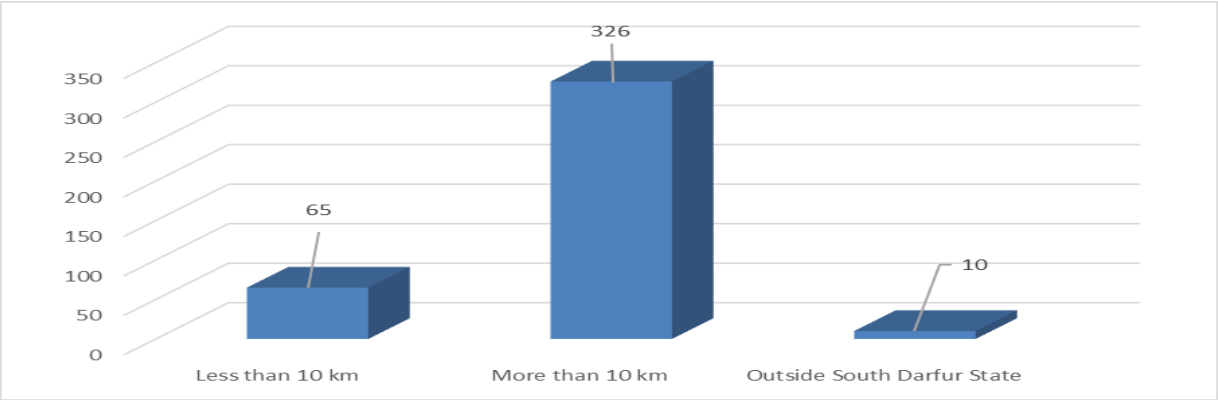

Figure 7.1: HH original place before the displacement to Alsalam camp among selected HHs for the study, November 2020, N = 401.

Households original place before the displacement to Alsalam camp; 81.3% (326) of the families were from areas located more than 10 km from the camp, while 16.2% (65) of HHs families came from distances less than 10 km and only 2.5% (10) of families came from outside South Darfur State.

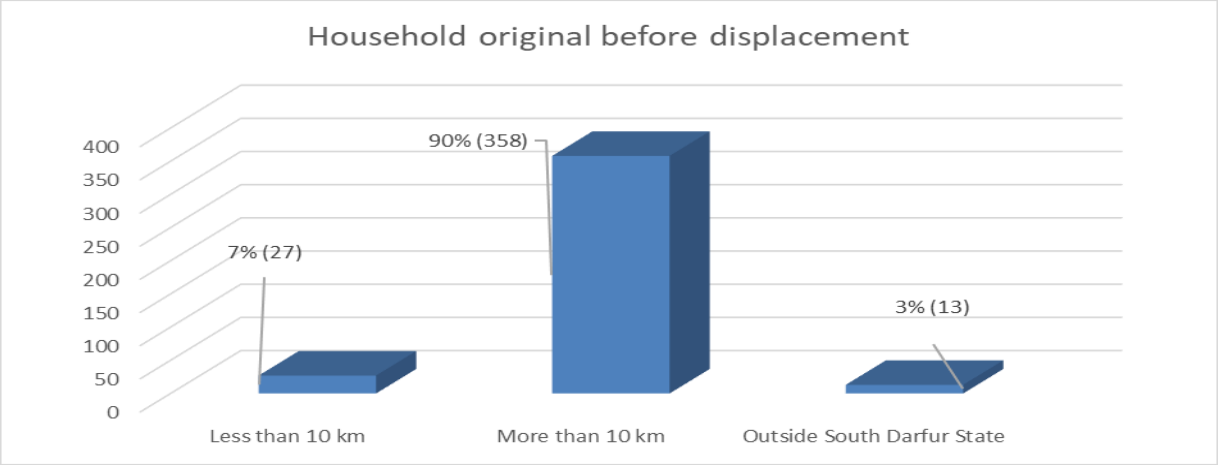

Figure 7.2: HH original place before the displacement to Alsalam camp among selected HHs for the study, November 2021, N = 398.

Household original place before the displacement to Alsalam; 90% (358) of the families came to the camp from the areas located more than 10 km from the camp, while 7% (27) of HHs families came from distances less than 10 km and only 3% (13) of families came from outside South Darfur State.

Comparison: the notable thing that people from their original come from the area more than 10 Kms are more in the sectors selected for this study 90% compared to those in the first part of the study was 81.3%.

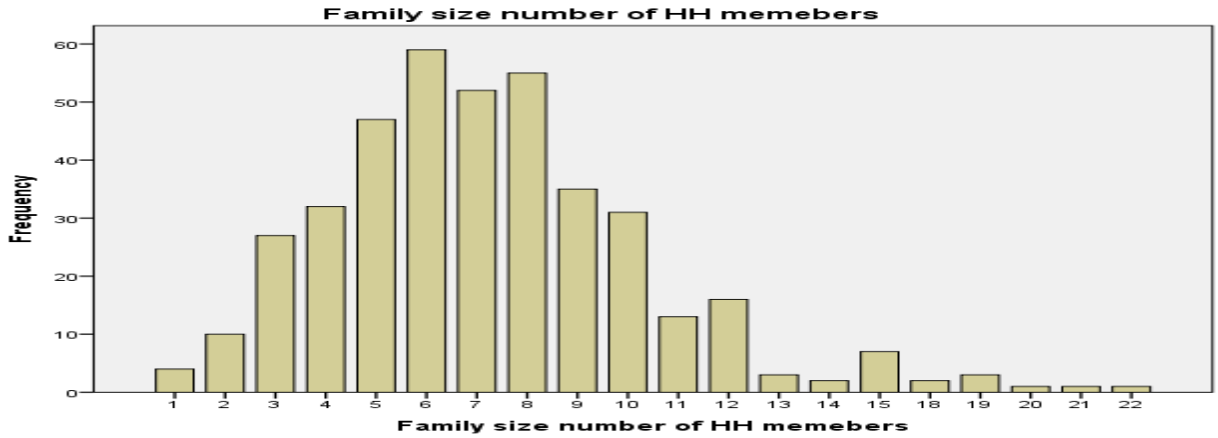

Figure 8.1: Family size (number of HHs` members) among studied HHs at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

Most of the families 59% their family members 6, followed by 8 and then 7 members with a mean of HHs members 7.27, median of 7, mode 6, and a standard deviation of 3.29 members.

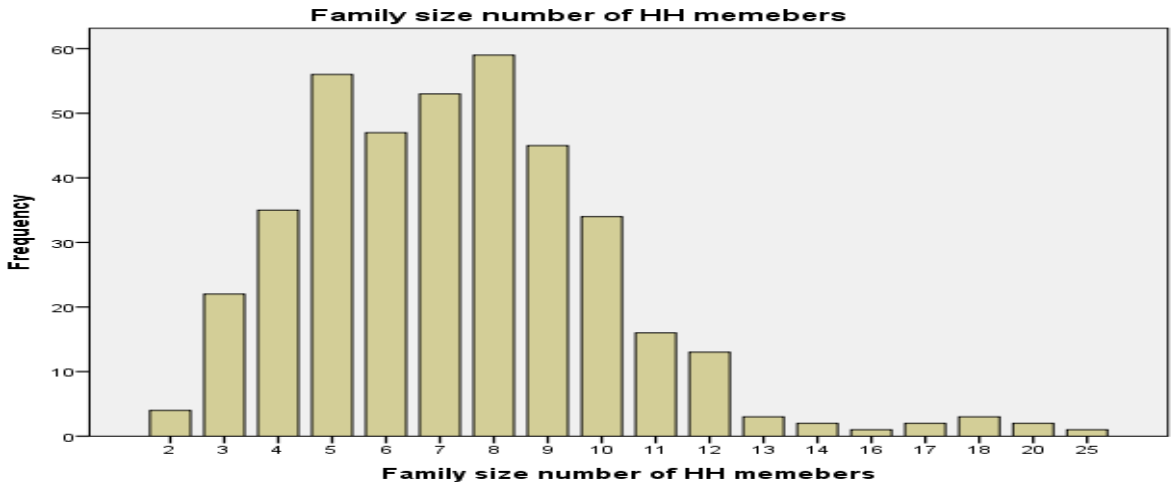

Figure 8.2: Family size (number of HHs` members) among studied HHs at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

In most families 59% their family members 8, followed by 5 and then 7 members with mean of HHs members 7.37, median 7, mode 8 and standard deviation of 3.021.

Comparison: The highest percentage was 6 members in the first part of the study compared to 8 in this study, other statistical values mean, median, mode and standard deviation remained almost similar between the two studies.

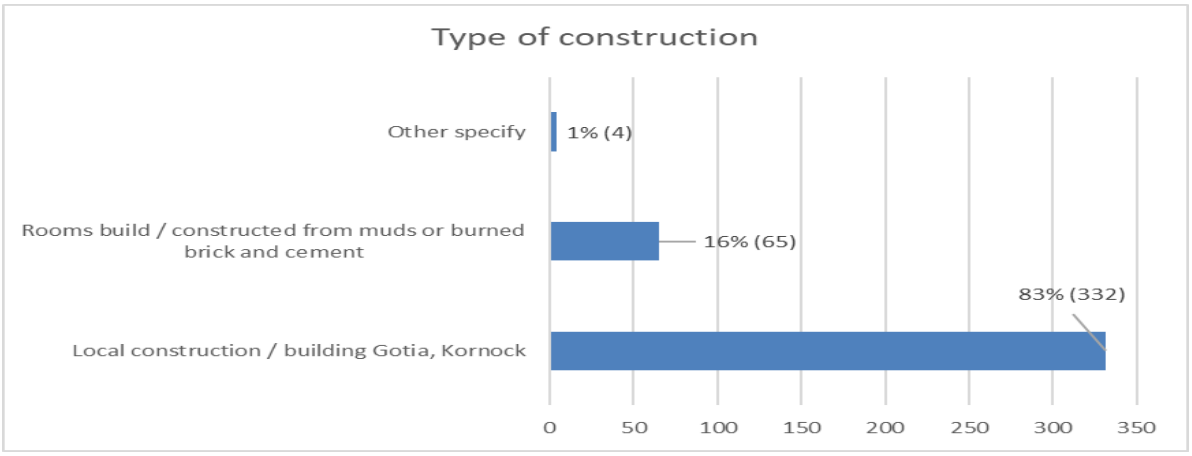

Figure 9.1: Type buildings in Alsalam camp among studied HHs at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

Type of household construction / buildings in Alsalam camp among studied HHs, 82.8% (332) of houses were built from the local materials in the shape of Gotia and Kornock, and 16.2% (65) were built from muds or burned brick and cement and only 1% (4) HHs were built from other materials.

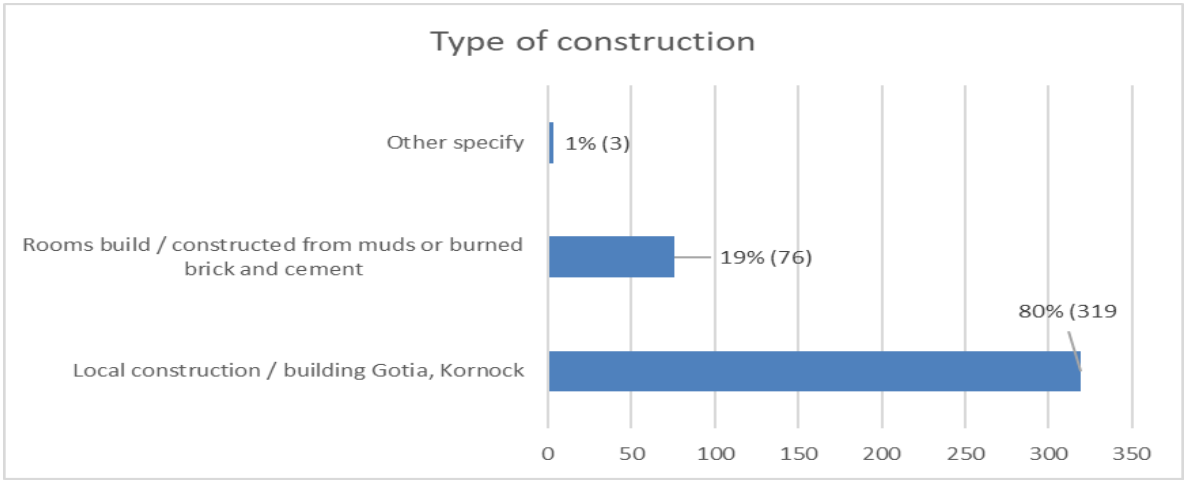

Figure 9.2: Type buildings in Alsalam camp among studied HHs at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

Eighty percent (319) of houses were built from the local materials in the shape of Gotia and Kornock, and 19% (76) were built from the muds or burned brick and cement and only 1% (3) HHs were built from other materials.

Comparison: No notable difference was remarked between the two studies.

Table 1.1: Number of HHs` members sleeping in a room at Alsalam, Nov 2020,

N = 401.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	8	2.0	2.0	2.0
	2	106	26.4	26.4	28.4
	3	132	32.9	32.9	61.3
	4	101	25.2	25.2	86.5
	5	28	7.0	7.0	93.5
	6	13	3.2	3.2	96.8
	7	10	2.5	2.5	99.3
	8	1	.2	.2	99.5
	9	1	.2	.2	99.8
	10	1	.2	.2	100.0
	Total	401	100.0	100.0	

There were 32.9% (132) of HHs with 3 members sleeping in a room, followed by 26.4% (106) for 2 persons, and 25.2% (101) with 4 persons, while 7% (28) of HHs where 5 persons / a room, some HHs; 3.2% (13) where 6 persons / a room, while less percentage 2% (8) recorded 1 person / room and the least percentage 0.2% (1) recorded in rooms with each 7, 9 and 10 persons.

Table 1.2: Number of HHs` members sleeping in a room at Alsalam, Nov 2021

N = 398.		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	1.0	1.0	1.0
	2	63	15.8	15.8	16.8
	3	163	41.0	41.0	57.8
	4	110	27.6	27.6	85.4
	5	34	8.5	8.5	94.0
	6	17	4.3	4.3	98.2
	7	3	.8	.8	99.0
	8	2	.5	.5	99.5
	9	1	.3	.3	99.7
	11	1	.3	.3	100.0
	Total	398	100.0	100.0	

There are 41% (163) of HHs with 3 members sleeping in a room, followed by 28% (110) for 4 persons, and 16% (63) for 2 persons, while 9% (34) of HHs where 5 persons / a room, some HHs; 4% (17) where 6 persons / a room, while less percentage only 1% (4) recorded where only 1 person / a room and least percentages recorded in a HHs where 7 or more members sleeping in a room.

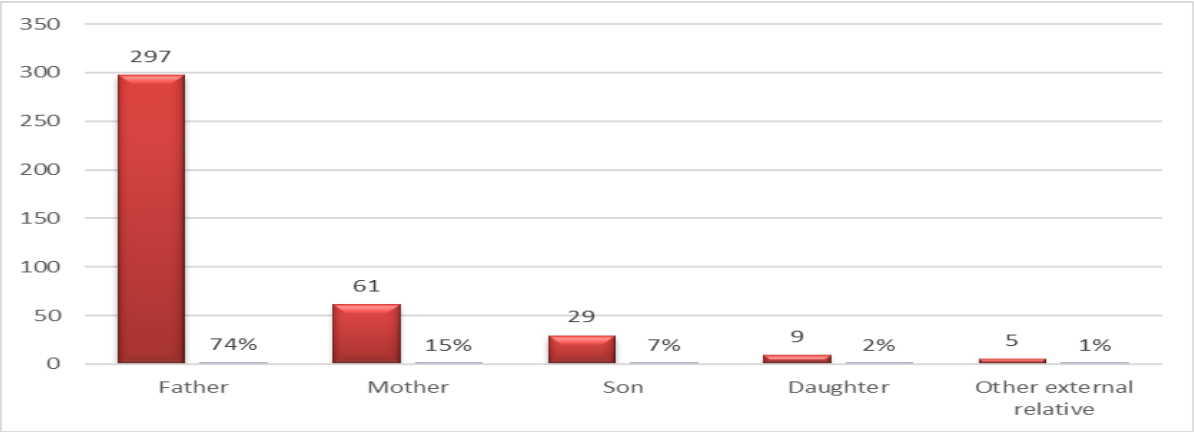

Figure 10.1: Household's head among the study population at Alsalam IDPs camp; South Darfur State, November 2020, N = 401.

Responsibility of household (family's head) for HHs in Alsalam, since males fathers were the greater number 74% (297), followed by female mothers 15.2% (61), while there 7.2% (29) of HHs headed by sons as well as fewer HHs 2.2% (9) headed by daughters. On other hand there some HHs 1.2% (5) headed by other external relatives.

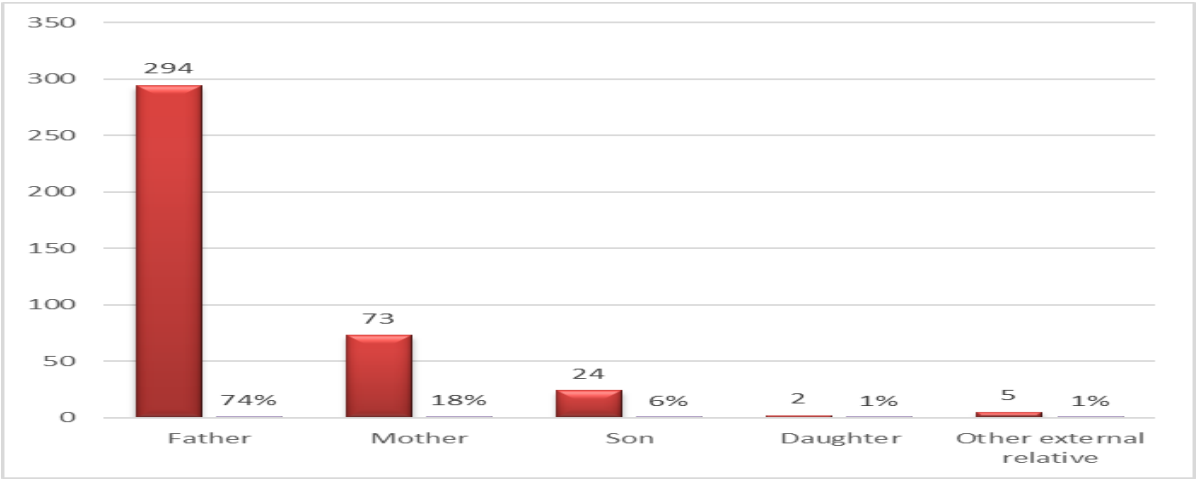

Figure 10.2: Household's head among the study population at Alsalam IDPs camp; South Darfur State, November 2021, N = 398.

Since HHs head males' fathers were the greater number 74% (294), followed by female mothers 18% (73), while there 6% (24) of HHs headed by sons as well as fewer HHs 1% (5) headed by other external relatives and 1% (2) headed by daughters.

Comparison: No notable difference was observed between the two studies.

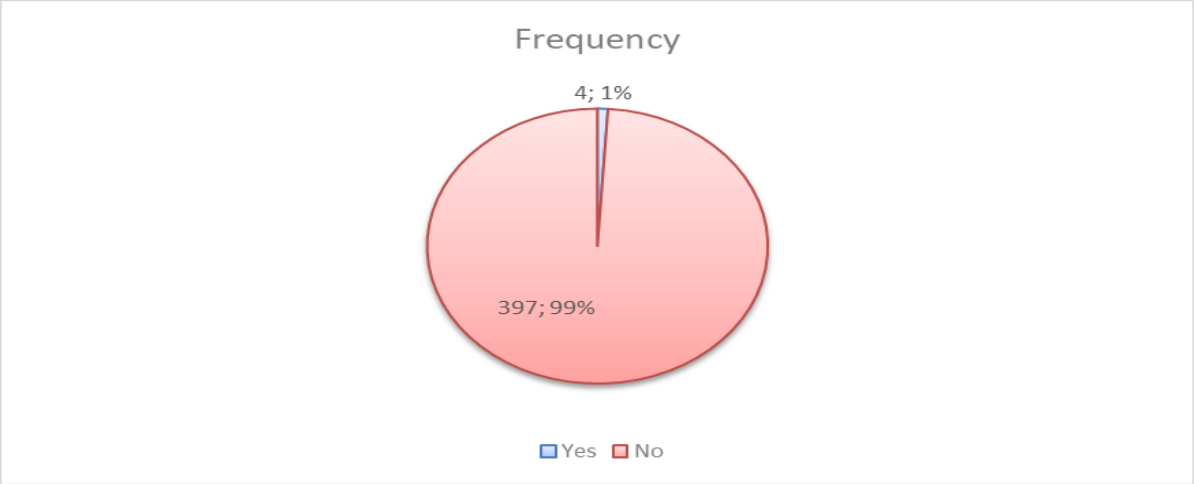

Figure 11.1: Prevalence of tuberculosis among interviewed persons (currently have TB and under treatment, during the study) at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

Prevalence of tuberculosis among interviewed persons (currently have TB and under treatment) at Alsalam IDPs camp, out of 401 HHs member interviewed 1% (4) of them has tuberculosis and currently under treatment.

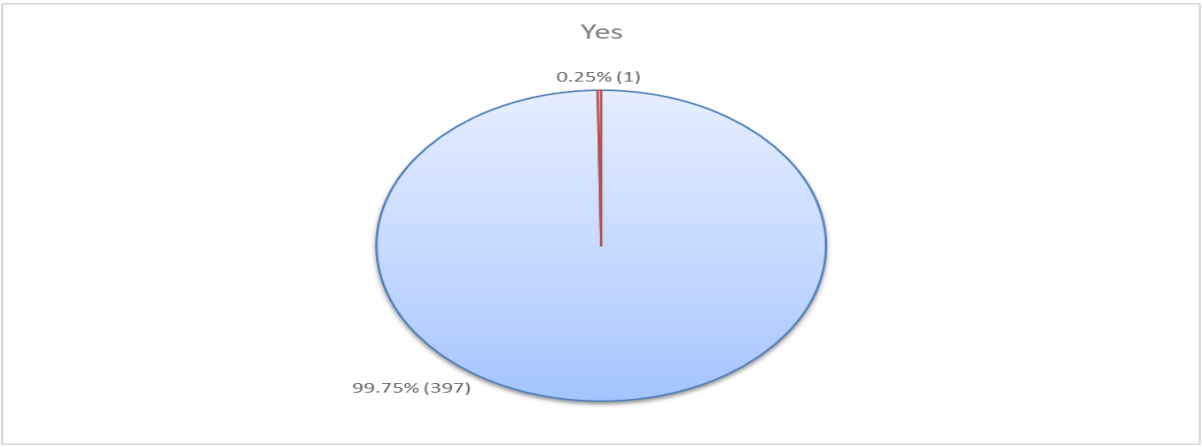

Figure 11.2: Prevalence of tuberculosis among interviewed persons (currently have TB and under treatment) at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

Prevalence of tuberculosis among interviewed persons (currently have TB and under treatment) at Alsalam IDPs camp, out of 398 HHs member interviewed there only one person 0.25% (1) has tuberculosis and currently under treatment.

Comparison: There were 4 HH members 1% in the previous study have TB and were under treatment during the study. Compared to 0.25% (1) in the second part of the study.

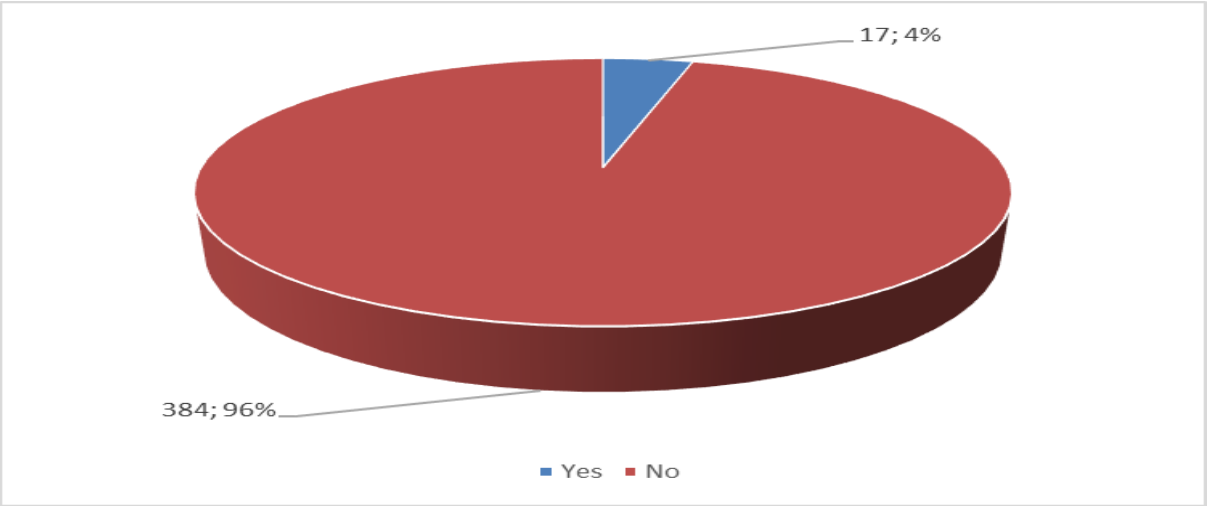

Figure 12.1: TB sign and symptoms (suspected TB) among HHs members at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

Persons with Tuberculosis signs and symptoms (suspected TB) among interviewed persons at Alsalam IDPs camp, there are 4% (17) of persons showed tuberculosis signs and symptoms being suspected TB and sent for TB test confirmation, while 96% (384) have no signs and symptoms of tuberculosis.

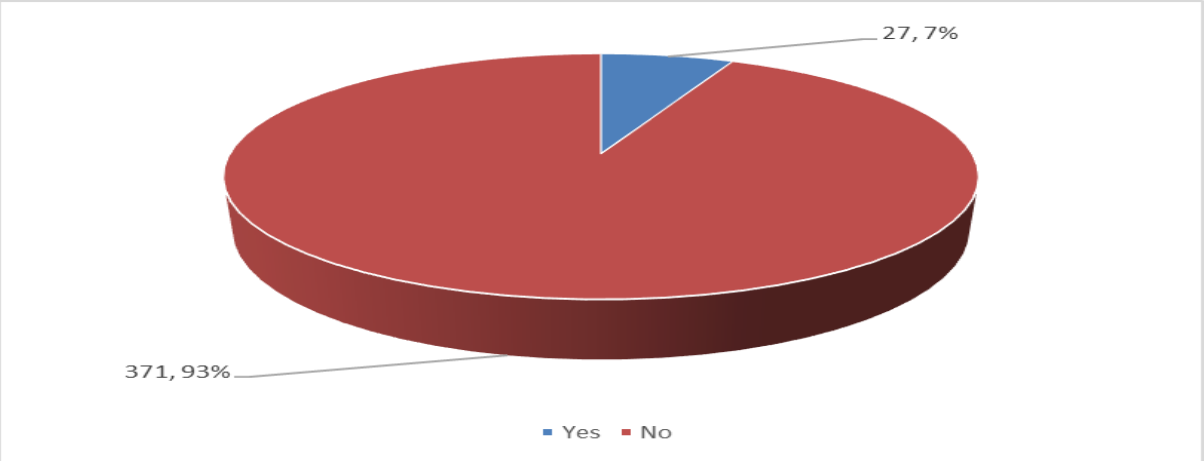

Figure 12.2: TB signs and symptoms (suspected TB) among HHs members at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

Persons with Tuberculosis signs and symptoms (suspected TB) among interviewed persons at Alsalam IDPs camp, there are 7% (27) persons showed tuberculosis sign and symptoms being suspected TB and sent for TB test confirmation, while 93% (371) have no signs and symptoms of tuberculosis.

Comparison: Suspected cases in the second part of the study 7% (27) appeared to be high than the suspected cases in the 1st study, which was 4% (17).

Table 2: Prevalence of tuberculosis among selected HHs (test results) at Alsalam IDPs camp, South Darfur State, November 2020

N = 401

TB status (if there are symptoms – sputum test results)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Positive	9	2.2	2.2	2.2
	Negative	392	97.8	97.8	100.0
	Total	401	100.0	100.0	

Prevalence of tuberculosis among interviewed persons (test results) at Alsalam IDPs camp, out of 17 suspected case sent for tuberculosis test 53% (9) of them positive and the prevalence of tuberculosis (positive cases) among the sample size is 2.2% (9).

Comparison: In the 2nd study no positive case detected out of 27 suspected cases, compared to 9 positive cases in the 1st study.

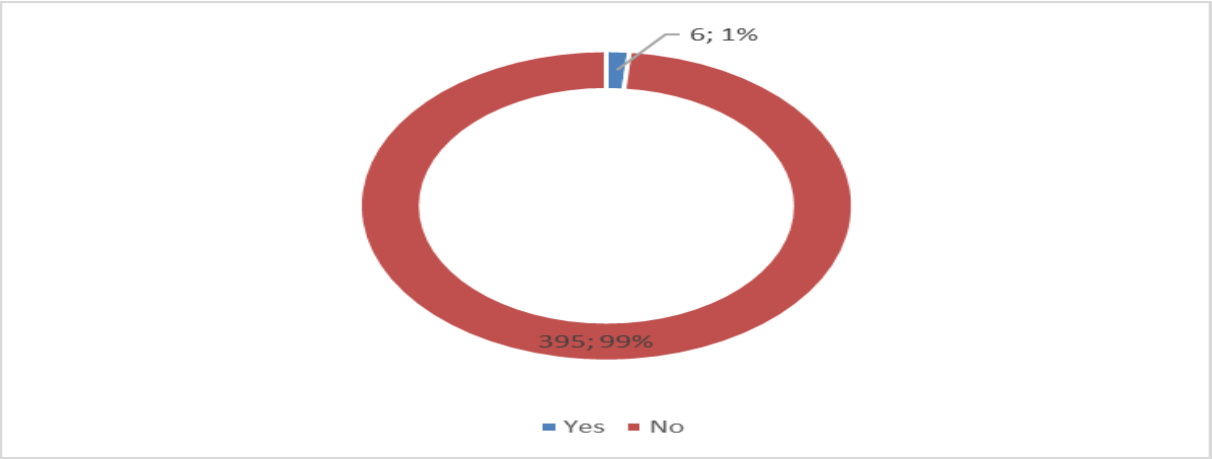

Figure 13.1: Presence of any tuberculosis patient at household during the last 6 months among interviewed member of HHs at Alsalam IDPs camp, South Darfur State, November 2020, N = 401.

Presence of any tuberculosis patient at household during the last 6 months among interviewed member of HHs at Alsalam IDPs camp there are 1% (6) household with TB patients during the last 6 months among the study population.

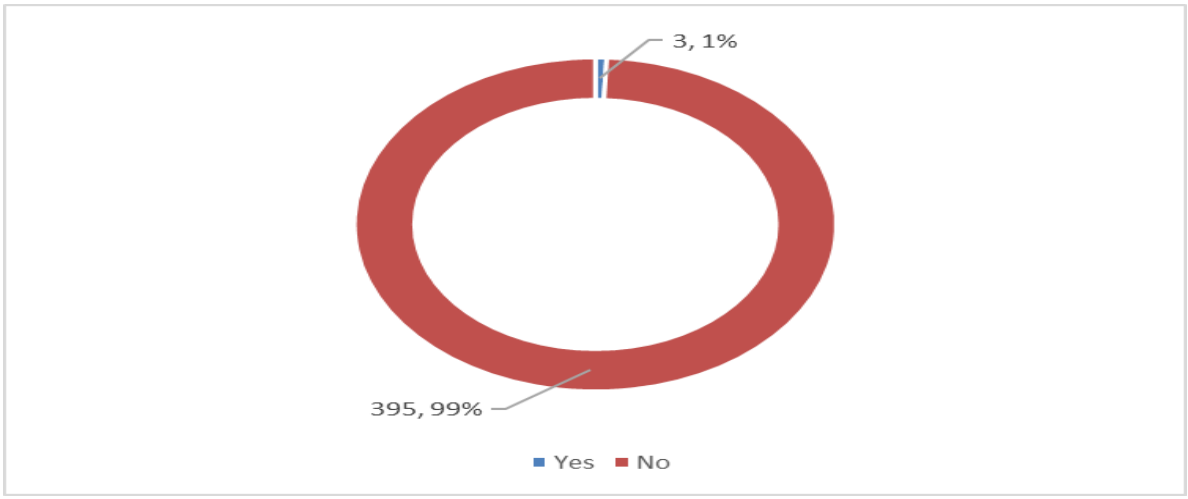

Figure 13.2: Presence of any tuberculosis patient at household during the last 6 months among interviewed member of HHs at Alsalam IDPs camp, South Darfur State, November 2021, N = 398.

Presence of any tuberculosis patient at household during the last 6 months among interviewed member of HHs at Alsalam IDPs camp there are 1% (3) household with TB patients during the last 6 months among the study population.

Comparison: No notable change was observed between the two studies.

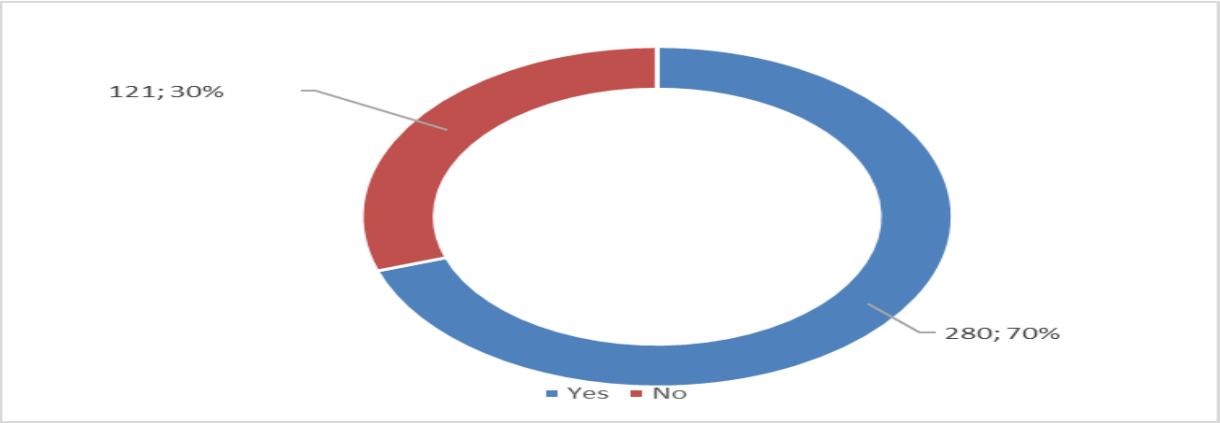

Figure 14.1: Knowledge of HHs members (if they heard of TB before) who participated in the study at Alsalam camp; SD State, Nov 2020, N = 401.

Knowledge of HHs members (if they hear of tuberculosis before) who participated in the study; 70% (280) of them confirmed that they did hear that there a disease called tuberculosis with its other synonyms including the local names while the others 30% (121) never hear of any disease call TB with its all form of names.

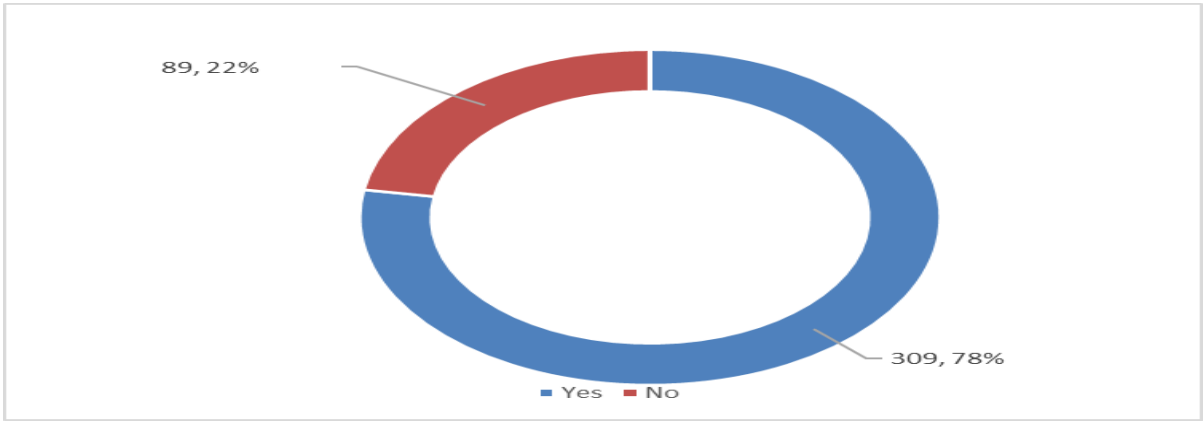

Figure 14.2: Knowledge of HHs members (if they heard of TB before) who participated in the study at Alsalam camp; SD State, Nov 2021, N = 398.

Knowledge of HHs members (if they hear of tuberculosis before) who participated in the study at Alsalam IDPs camp; 78% (309) of them confirmed that they did hear that there a disease called tuberculosis with its other synonyms including the local names while the others 22% (89) never hear of any disease named TB with its all form of names.

Comparison: The difference is 8% of the 2nd group of the study knowing about this compared to group of HHs in the first part of the study.

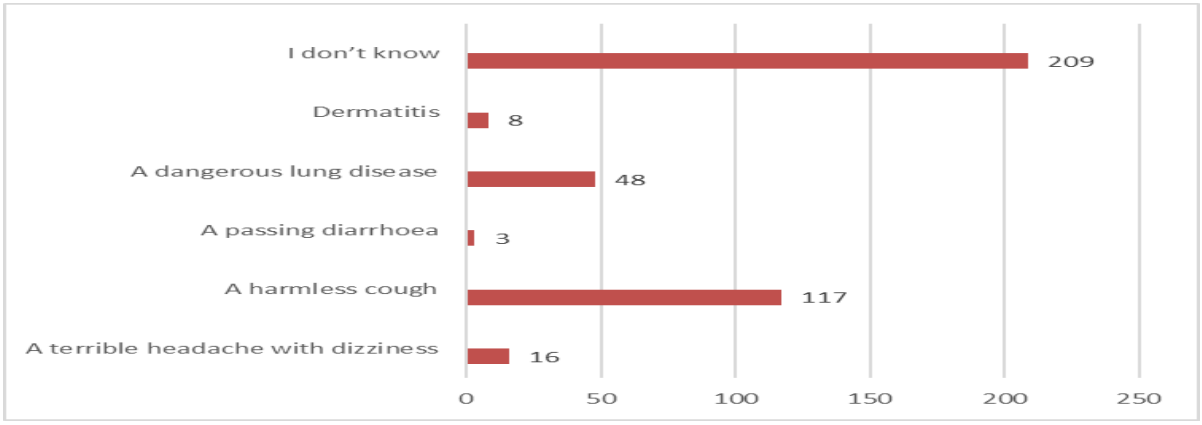

Figure 15.1: A simple knowledge, recognized definition of TB from population, at ALsalalm IDPs camp; SD State, Nov 2020, N = 401.

Majority 52.1% (209) do don't know about TB, followed by those recognize TB as a harmless cough 29.2% (117), and then those who know TB as dangerous lung disease 12% (48), and from fewer HHs 4% (16) defined TB as a terrible headache with dizziness, while only 2% (8) of respondents said TB is a kind of dermatitis or skin disease and the least percentage 0.7% (3) defined TB as a passing diarrhea.

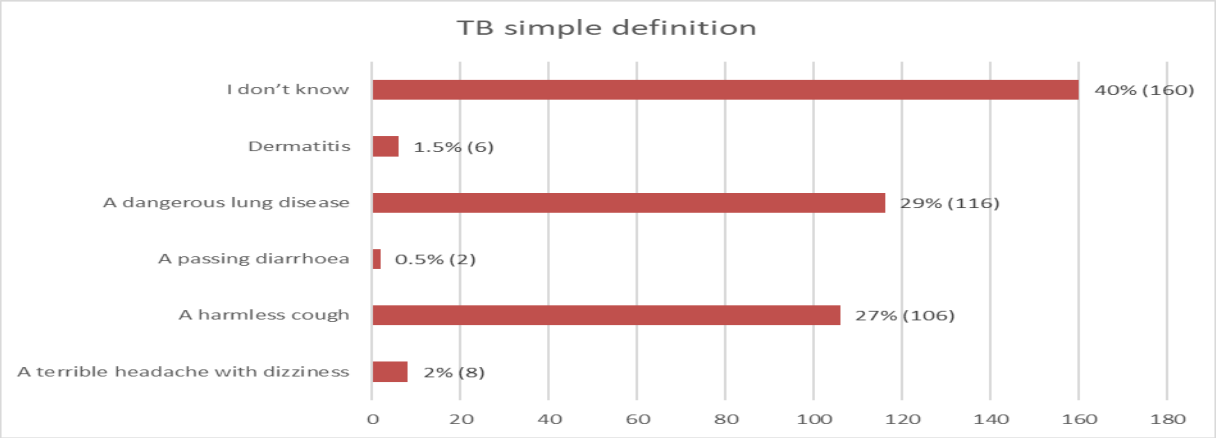

Figure 15.2: A simple knowledge on recognized definition of TB from population, at Alsalalm IDPs camp; SD State, Nov 2021, N = 398.

Majority 40% (160) do don't know about TB, followed by those recognize TB as dangerous lung disease 29% (116), then those know TB as a harmless cough 27% (106), fewer HHs 4% (16) defined TB as a terrible headache with dizziness, or it a kind of dermatitis or skin disease or defined TB as a passing diarrhea.

Comparison: No notable observation to be compared between the two studies.

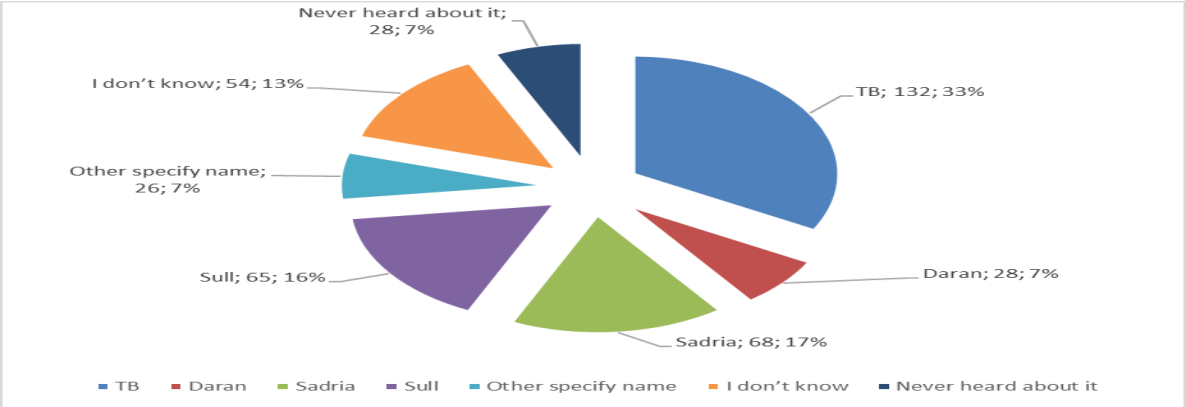

Figure 16.1: locally recognized and familiar name of TB among the study population, at ALsalalm IDPs camp; SD State, November 2020, N = 401.

30% (132) of the population knowing that this disease locally called TB, followed by 17% (68) of people call it Sadria Arabic name, 16% (65) call it Sull, while 13% (54) answered that they do not know its name and equal percentages 7% (28) answered that the disease is called 1) Duran arabic name, 2) they never heart abut TB or 3) specified other name of it, and specified 8 other local names of it.

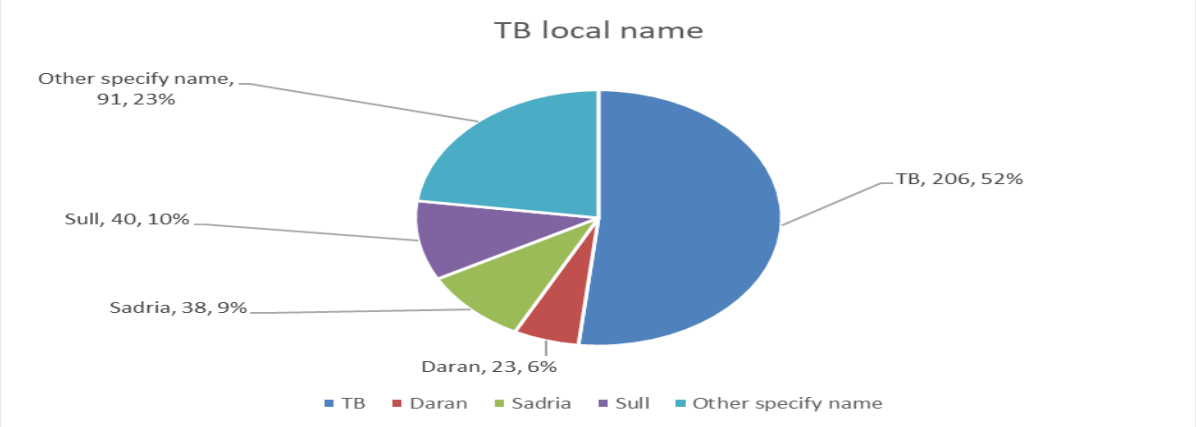

Figure 16.2: locally recognized and familiar name of TB among the study population, at ALsalalm IDPs camp; SD State, November 2021, N = 398.

52% (206) of the population knowing that this disease locally called TB, followed by 23% (91) gave other names not listed or their answered don not know its local name or even never heard about it, 10% (499) called Sull and 9% (38) called it Sadria and the least percentage of people 6% (23) called the disease Daran.

Comparison: The different appeared that after health education intervention more people call the disease TB 52% this was 33% in the first part of the study.

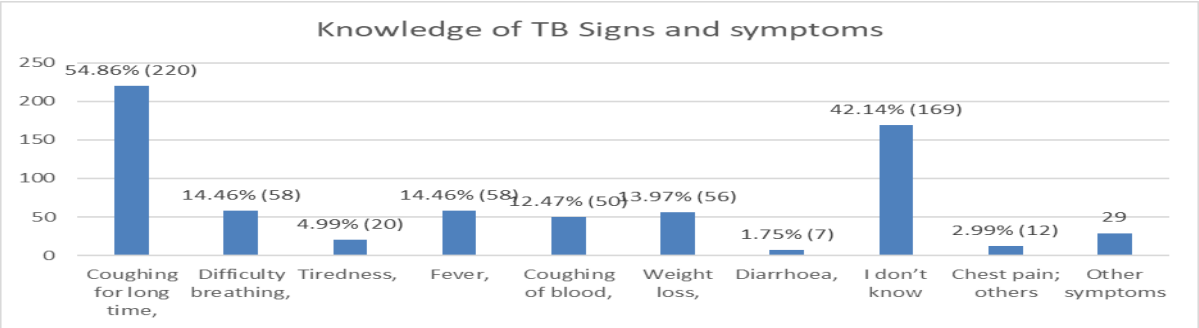

Figure 17.1: Knowledge of people in the study TB signs Nov 2020, N = 401.

54.86% (220) of people know that TB sign and symptoms is coughing for long time, while 42.14% (169) responded they do not know the sign and symptoms of TB, an equal percentage 14.46% (58) said TB signs and symptoms are fever or difficulty of breathing, 13.97% (56) see that TB sign and symptoms is wight loss and 12.47% (50) see that coughing of blood is a sign or symptoms of TB, while 7.23% (29) mentioned others symptoms and 4.99% (20) see the symptoms of TB is tireless, only 1.75% (7) see symptoms is diarrhea.

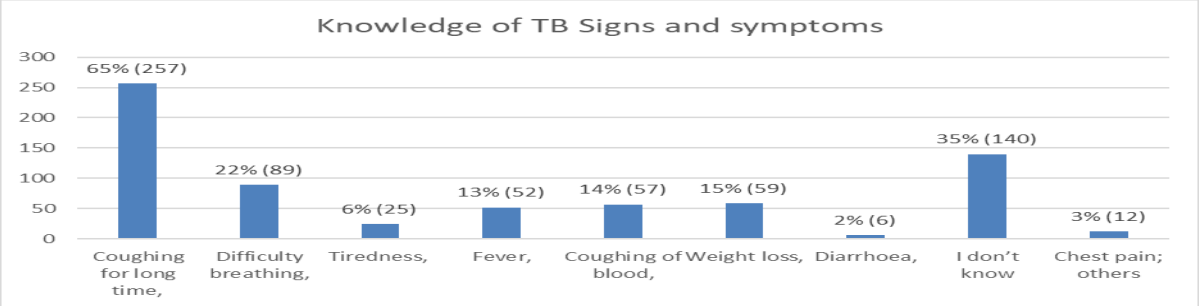

Figure 17.2: Knowledge of people under study of TB symptoms at Alsalam IDPs camp; South Darfur State, November 2020.

65% of people know that signs and symptoms is coughing for long time, while 35% of the group said do not know the sign and symptoms of TB, almost equal percentages 14% of people said TB signs and symptoms are fever, difficulty of breathing or weight loss, and 14% see that coughing of blood is a signs or symptoms of TB, 6% see the symptoms of TB is tireless and 3% mentioned symptoms is chest pain and 2% mentioned symptoms is diarrhea.

Comparison: Increase by 11% in the knowledge of IDPs about TB sign and symptoms is coughing for long time, and 3% knowledge increase of sign and symptoms is coughing up blood.

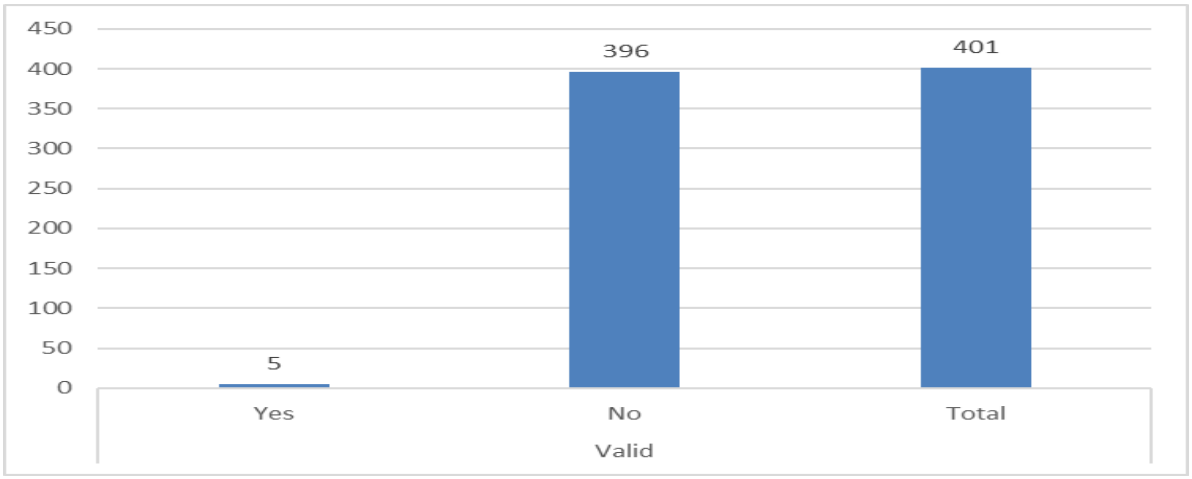

Figure 18.1: History of infection with tuberculosis among Alsalam IDPs at Alsalam camp; South Darfur State, November 2020, N = 401.

History of infection with tuberculosis among Alsalam IDPS at Alsalam IDPs camp; only 1.2% (5) out of 401 interviewed HHs member have has history of infection with tuberculosis in different period from 2 months to 240 months.

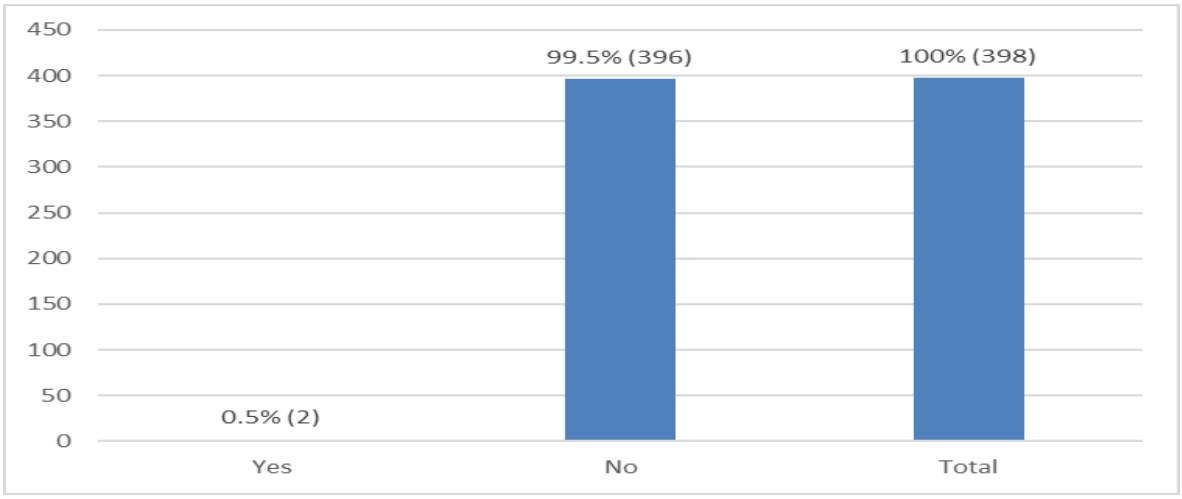

Figure 18.2: History of infection with tuberculosis among Alsalam IDPs at Alsalam camp; South Darfur State, November 2021, N = 398.

Only 0.5% (2) out of 398 interviewed HHs member have has history of infection with tuberculosis in different period from 12 months to 42 months.

Comparison: No notable change between the pre and after intervention.

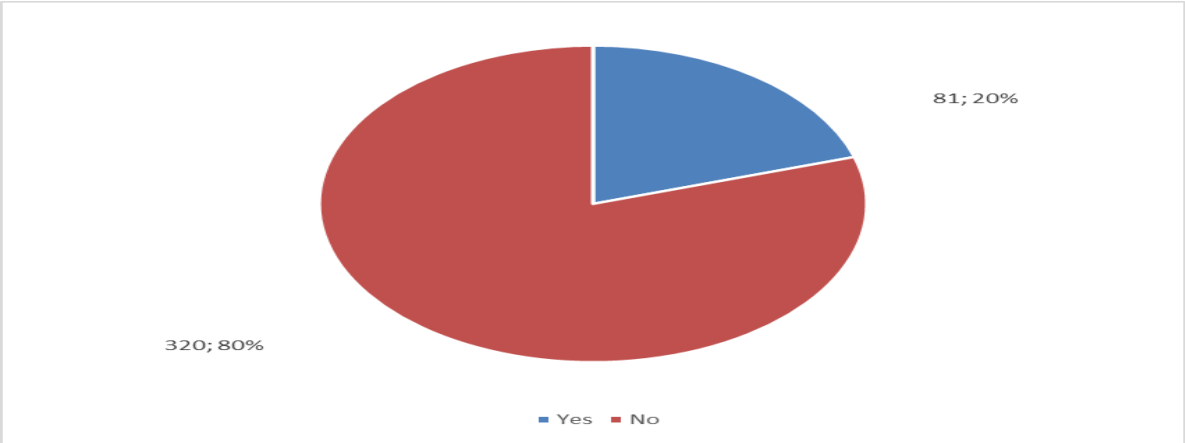

Figure 19.1: Experiences of interviewed persons in Alsalam camp if they know someone at community who had been infected with TB a Alsalam IDPs; South Darfur State, November 2020, N = 401.

A history of infection with tuberculosis among Alsalam ID at Alsalam IDPs camp; 20% (81) of them answered they have known someone before who has been infected with tuberculosis, while 80% (320) did not know anyone before have infected with TB.

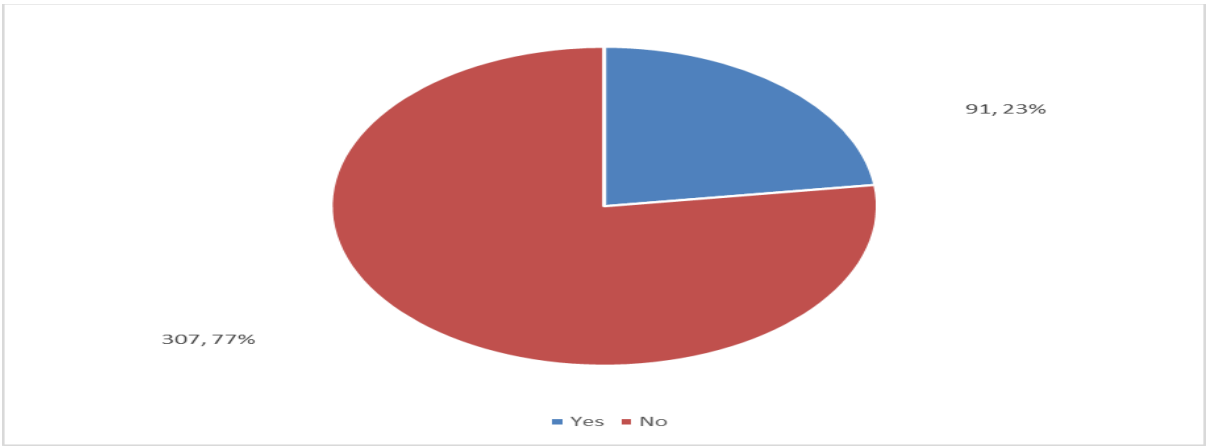

Figure 19.2: Experiences of interviewed persons in Alsalam if they know someone at community who had been infected with TB at Alsalam camp; South Darfur State, November 2021, N = 398.

History of infection with tuberculosis among Alsalam IDPs; 23% (91) of them answered they have known someone before who had been infected with tuberculosis, while 77% (307) they never know anyone before who have infected with TB.

Comparison: There a 3% different increase of people who have known someone who have been infected with TB.

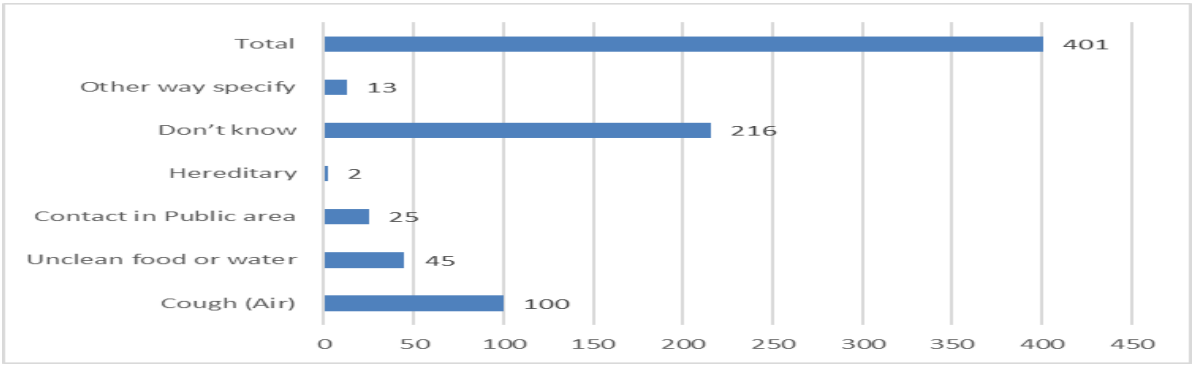

Figure 20.1: The knowledge of people how TB transmitted; November 2020, N = 401.

Most people 53.9% (216) don't know the way of transmission, while 24.9% (100) of people said TB is transmitted through cough and air and 11.2% (45) said it transmits through unclean food or water while 6.2% (25) see that TB is transmitted through contacting others in public areas, followed by 3.2% (13) see there other way of transmission like clothes, blood transfusion, smoking, bad weather, dusts etc. there smallest percentage 0.5% (2) TB is heredity disease.

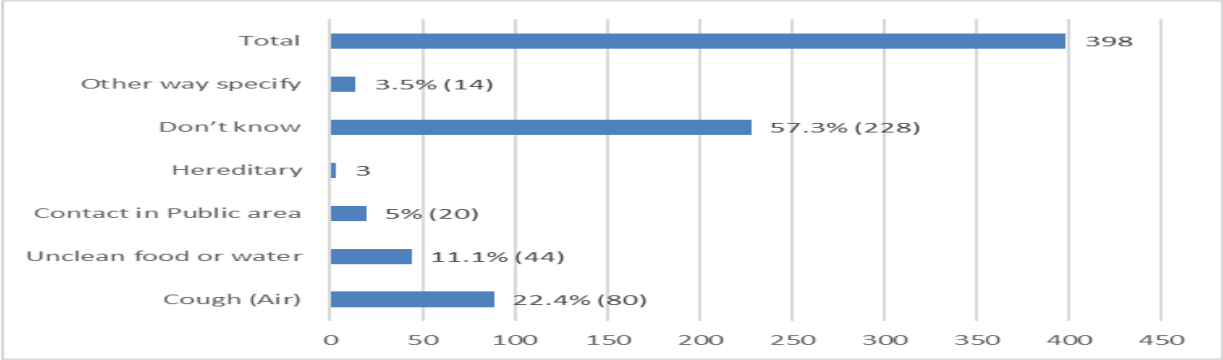

Figure 20.2: The knowledge of people, how TB transmitted; Nov 21, N=398.

In the 1nd part of the study, most people 57.3% (228) don't know the way of TB transmission, 22.4% (80) said TB is transmitted through cough and air, there 11.1% (44) said it transmits through unclean food or water while 5% (20) see that TB is transmitted through contacting others in public areas, followed by 3.5% (14) of those other way of transmission i.e. clothes, blood transfusion, smoking, bad weather, dusts etc. least percentage is 0.8% (3) TB is heredity disease.

Comparison: There still gap of knowledge of people do not know the way of TB transmission, in the lack of knowledge the difference 3% in the part of the study, although there an increase of knowledge in the positive site.

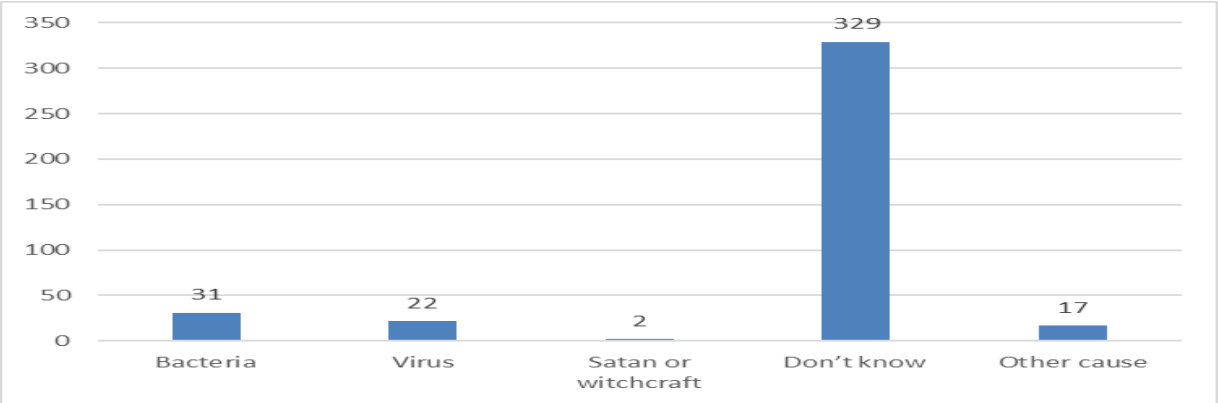

Figure 21.1: The knowledge of people about TB cause; Nov 2020, N = 401.

The knowledge of people in Alsalam, about the TB cause at the camp; most of the people, 82% (329) answered they don't know the causative agent of TB, 7.7% (31) of people said TB it causes by the bacteria, and 5.5% (22) said it causes by virus. In comparison 4.2% (17) mentioned other causes of TB like, bad weather, cold weather, dusts and fatigue, smokes, hunger, mining dust and smoking, there few percentages 0.5% (2) believe that TB caused by Satan or witchcraft.

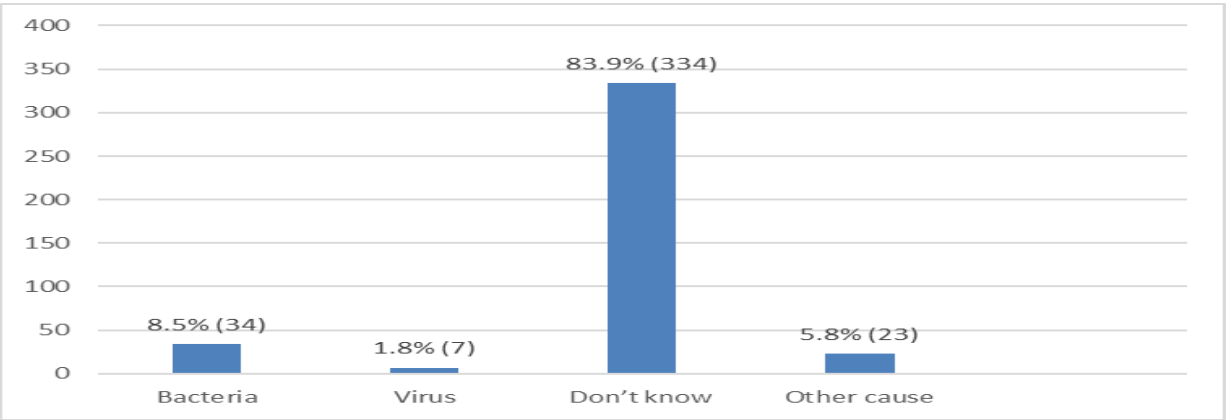

Figure 21.2: The knowledge of people about TB cause; Nov 2021, N = 398.

The knowledge of people in Alsalam camp about the TB causative agent; most people, 83.9% (334) answered that they don't know the cause of TB, while only 8.5% (34) of people know of the causative agent and said it causes by the bacteria, and 5.8% (23) mentioned other causes of TB like bad weather, smoking, fatigue hunger or mining dust, there are 1.8% (7) said that it causes by virus while.

Comparison: Percentage looks similar between the two studies, no big different to be mentioned.

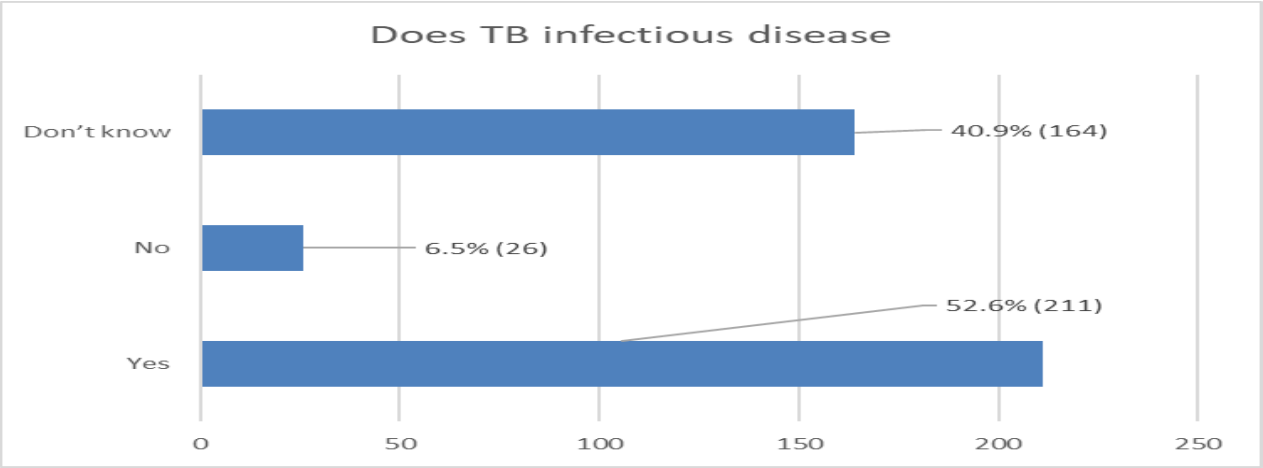

Figure 22.1: The knowledge of people in Alsalam camp about whether TB infectious or not at Alsalam IDPs camp; SD State, November 2020, N = 401.

From the study population 52.6% (211) believe that TB is an infectious disease while 40.9% (164) answered they don't know if it infectious or not and 6.5% (26) of respondents see that TB is not infectious disease.

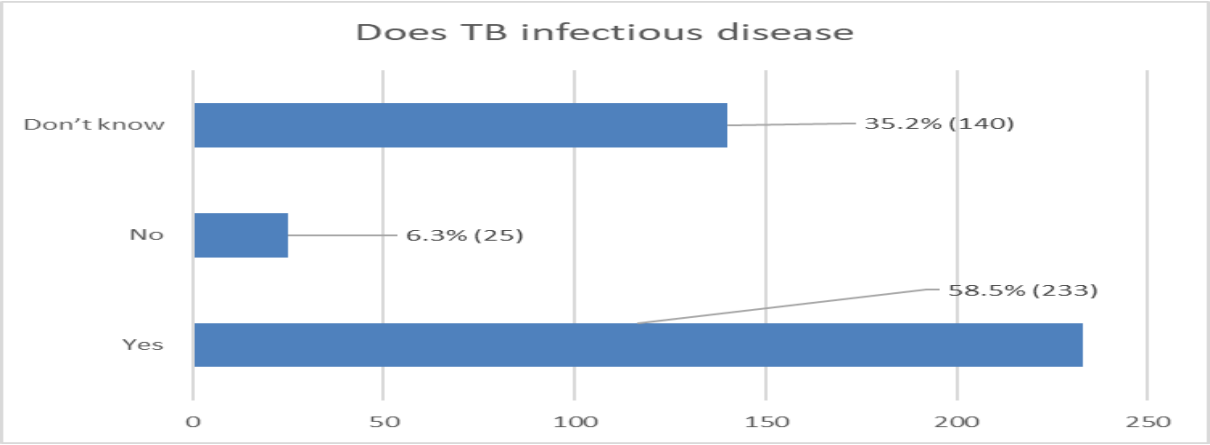

Figure 22.2: The knowledge of people in Alsalam camp about TB if it infectious or not; SD State, November 2021, N = 398.

The knowledge of people in Alsalam camp about TB if it infectious or not at Alsalam IDPs camp; 58.5% (233) believe that TB is an infectious disease while 35.2% (140) answered they don't know if it infectious or not and 6.3% (25) of respondents see that TB is not infectious disease.

Comparison: it is appeared that there an increase in the number of respondents those see TB is an infectious disease from 52.6% in last study to 58.5%, and the reduction of the number of people they do not know if it infectious or not.

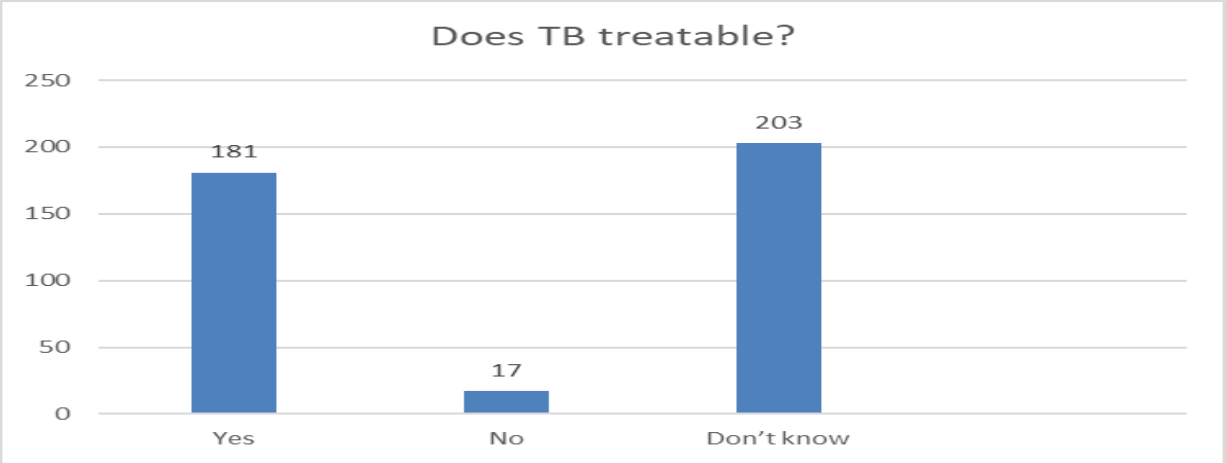

Figure 23.1: The knowledge of people in Alsalam camp about TB if it treatable or not at Alsalam IDPs camp; SD State, November 2020, N = 401.

Out of 401 sample size 50.6% (203) answered they don't know if TB can be treated or not, while 45.1% (181) answered that TB can be treated and 4.2% (17) of respondents believe that TB can not be treated.

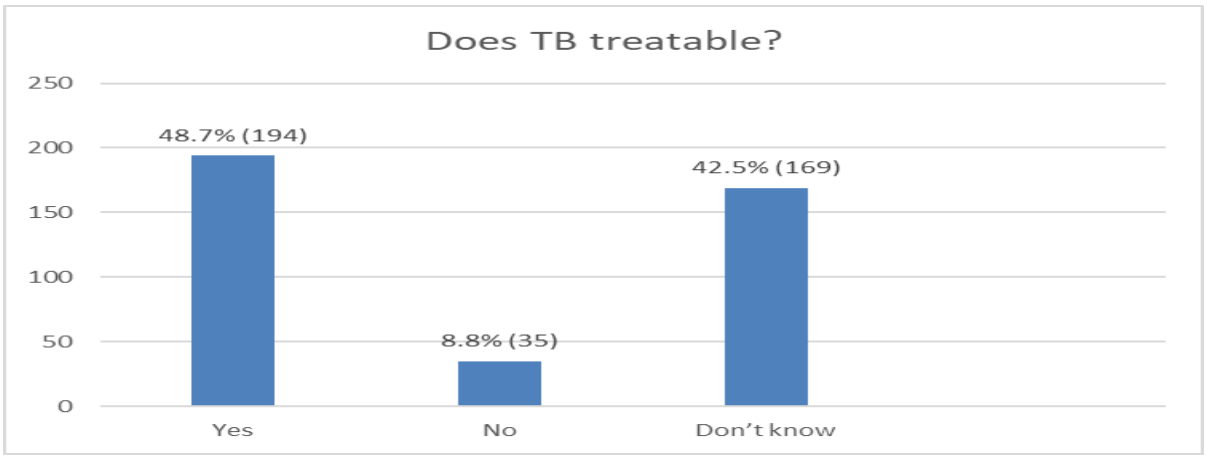

Figure 23.2: The knowledge of people in Alsalam camp about tuberculosis if it treatable or not at Alsalam IDPs camp; SD State, November 2021, N = 398.

In the second part of the study out of 398 sample size 48.7% answered that tuberculosis can be treated while 42.5% answered they d9d't know if tuberculosis can be treated or not, and 8.8% of respondents believe that TB can not be treated.

Comparison: The knowledge of people see that TB is treatable increased by almost 4% from 45.1% to 48.1%, as well there an increase in people say TB is not treatable. While there a decrease of people who do not know if it treatable or not.

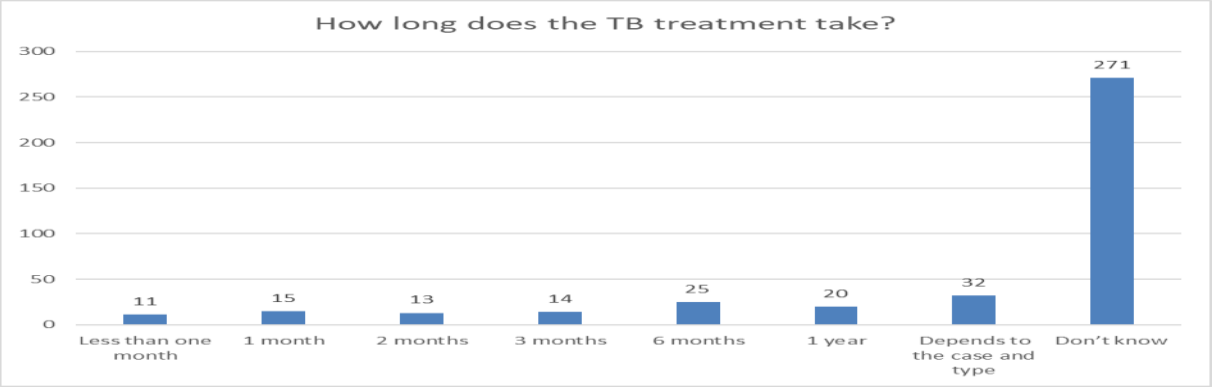

Figure 24.1: The knowledge of people in Alsalam IDPs camp of how long TB treatment takes, at Alsalam camp; South Darfur State, Nov 2020, N = 401.

The knowledge of people how long TB treatment takes, out of 401, 67.6% (271) answered that they don't know how long TB treatment take, 8% (32) responded that treatment period depend on the case and type of TB, and 6.2% (25) said it takes 6 months and 5% (20) answered that TB treatment takes one year, there are less percentage from 2 – 3 % answered that it will takes from 1 month to 3 months.

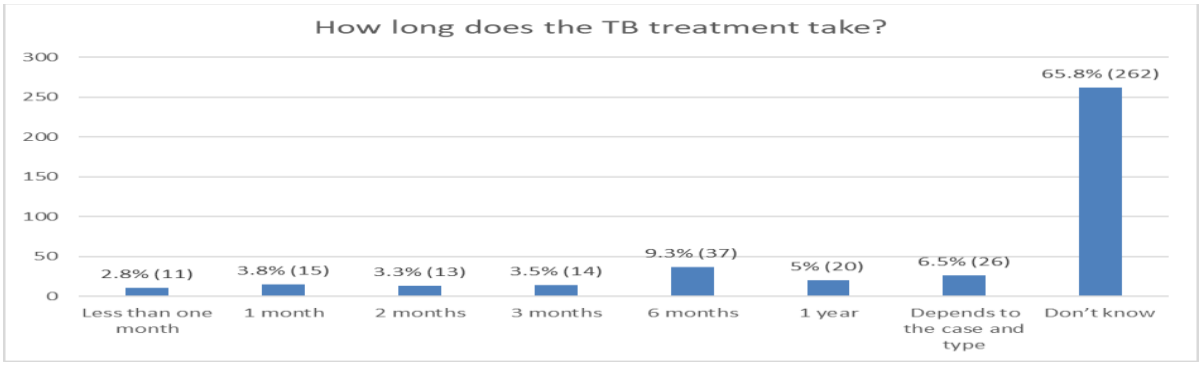

Figure 24.2: The knowledge of people in Alsalam camp of how long TB treatment takes, at Alsalam IDPs camp; SD State, November 2021, N = 398.

In 2nd part of the study, 398 interviewed persons, 65.8% (262), answered that they don't know how long TB treatment take, while 9.3% (37) said it takes 6 months, 6.5% (26) responded that the treatment period depends on the case and type of TB, and 5% (20) answered that TB treatment takes one year while there are less percentages from 2.8 – 3.5 % answered that it will takes from 1 to 3 months.

Comparison: There an increase of people answered correctly; treatment takes 6 months by 3% and slight decrease among those don't know the treatment period.

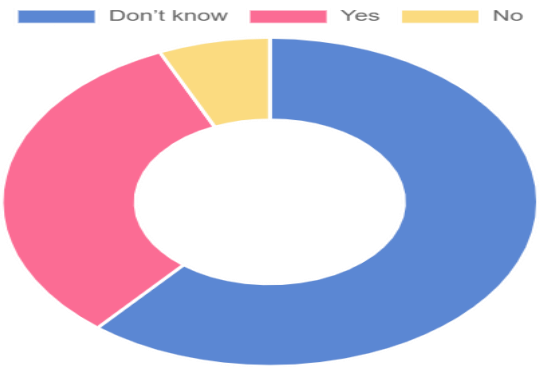

Figure 25.1: The knowledge of IDPs in Alsalam camp if the recovery of TB complete after taking the treatment; SD State, November 2020, N = 401.

The knowledge of people if the recovery of TB complete after taking the treatment; out of the 401-sample size 61.1% (245) answered that they don't know if recovery of TB complete or not after taking treatment, while 32.2% (129) answered that patient can completely recovers from TB after the treatment, 6.7% (27) of respondents answered that patient cannot recover from TB after treatment.

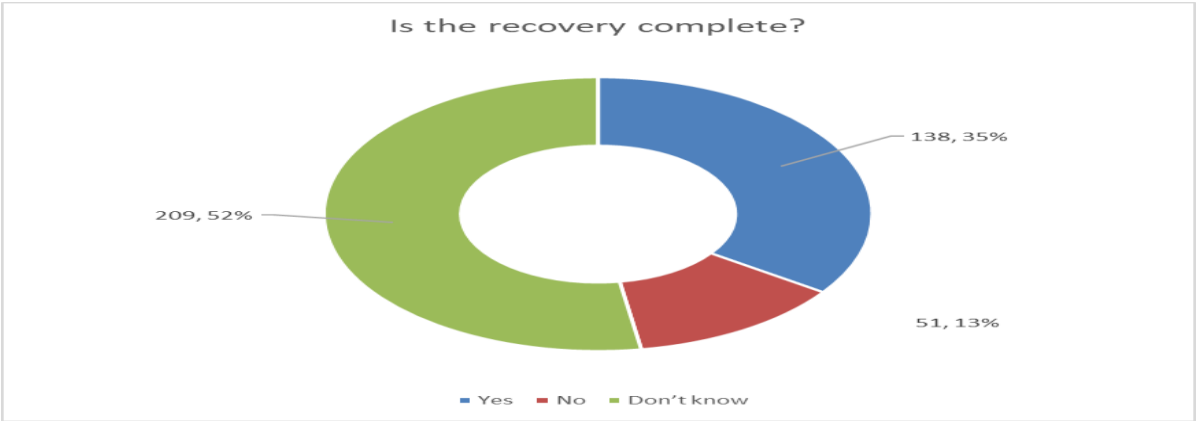

Figure 25.2: The knowledge of people if the recovery of TB complete after taking the treatment, November 2021, N = 398.

In the second part of the study, out of the 398, 52% (209) answered that they don't know if recovery of TB complete or not after taking treatment, while 35% (138) answered that patient can completely recover after the treatment, there 13% (51) of respondents believe that patient can not recover from TB after taking treatment.

Comparison: There a 9% decrease in the second part of the study as they do not know if the recovery can complete, at the same time 3% increase of those say the recovery complete.

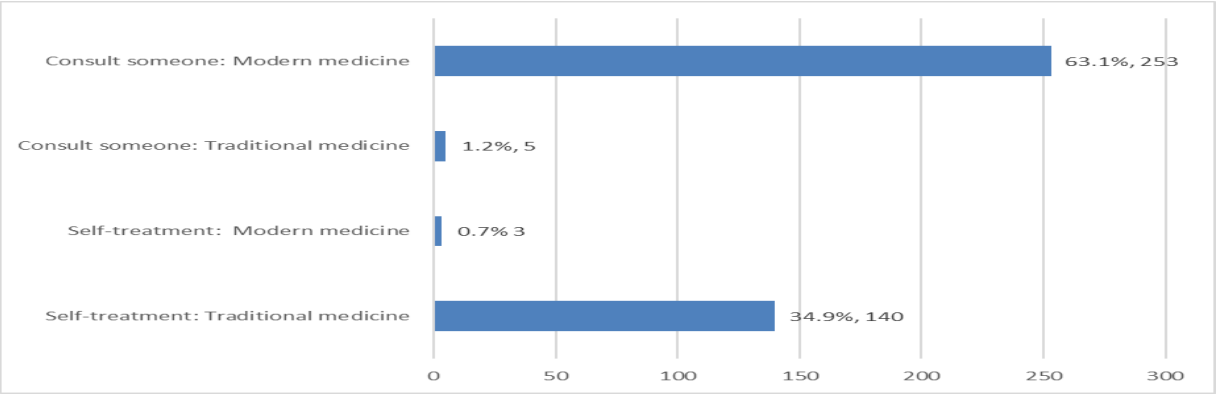

Figure 26.1: Attitudes and practices of people in Alsalam IDPs camp when they have cough with blood what they do; SD State, November 2020, N = 401.

Attitudes and practices of people in Alsalam IDPs camp when they have cough with blood; 63.1% (253) of people seek modern medicine like consulting health cadre or visit a doctor, and 34.9% (140) practice Self-treatment and use traditional medicine, while less percentage of people 1.2% (5) consult someone to use tradition medicine 0.7% (3) relay on self-treatment use modern medicine.

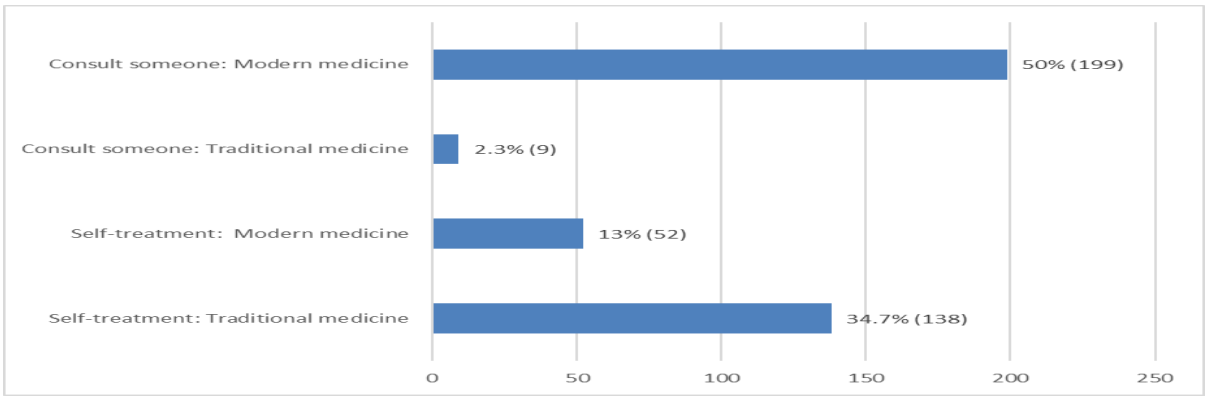

Figure 26.2: Attitudes and practices of IDPs in Alsalam camp when they have a cough with blood at the Alsalam IDPs camp; SD State, Nov 2021, N = 398.

Attitudes and practices of people when they have cough with blood; 50% of people seek for modern medicine like to consult health cadre or visit a doctor, 34.7% practice Self-treatment and use traditional medicine, while less percentage of people 2.3% consulting someone to use traditional medicine and 13% rely on self-treatment use modern medicine.

Comparison: There is an increase in people using modern medicine without consultation, and there a decrease in the percentage of people seeking medical consultation in the case of coughing with bloody sputum.

Table 3.1: Attitudes and practices of people in Alsalam IDPs camp. If one has a persistent cough without blood, what they would do; Nov 2020, N = 401.

If you had a persistent cough with no blood, what would you do?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Nothing	40	10.0	10.0	10.0
Ask a family member or a friend	26	6.5	6.5	16.5
Self –treatment	51	12.7	12.7	29.2
Wait for sometime before consulting a health care provider	150	37.4	37.4	66.6
Other	134	33.4	33.4	100.0
Total	401	100.0	100.0	

37.4% (150) of people answered that they wait for some time before consulting a health care provider if they have persistent cough without blood and there 33.4% (134) mentioned they will do other practices while 12.7% (51) relay for self-treatment and 10% (40) said do not do anything, there less percentage of people 6.5 (26) they ask family member or friend for the help.

Table 3.2: Attitudes and practices of people in Alsalam IDPs camp. If one has a persistent cough without blood what they would do, Nov 2021, N = 398.

If you had a persistent cough with no blood, what would you do?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Nothing	26	6.5	6.5	6.5
Ask a family member or a friend	32	8.0	8.0	14.6
Self –treatment	90	22.6	22.6	37.2
Wait for sometime before consulting a health care provider	198	49.7	49.7	86.9
Other	52	13.1	13.1	100.0
Total	398	100.0	100.0	

49.7% of people wait for some time before consulting a health care provider if they have a persistent cough without blood, there 13.1% mentioned they will do other practices while 22.6% relay for self-treatment and 8% ask family members or friends for the help and less percentage of people 6.5% said do not do anything.

Comparison: There is a 7% different between the 2 studies on those waiting for some time and 20% different for others and increase of 10% of self-treatment.

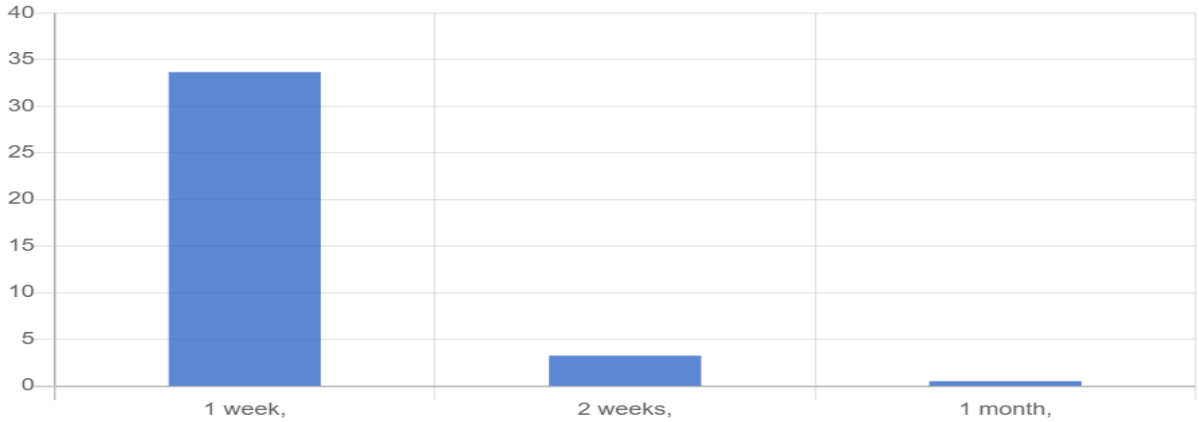

Figure 27.1: Attitudes and practices of people in Alsalam IDPs camp for those have a persistent cough without blood and wait for some time how long they wait; November 2020, N = 150.

Attitudes and practices of people who have a persistent cough without blood and wait for somehow long wait; there were 37.4% (150) of people answered that they wait for some time before consulting a health care provider if they have a persistent cough without blood. Of these 150; 90% (135) wait for one week and 8.7% (13) wait for 2 weeks and there are only 1.3% (2) wait up to one month.

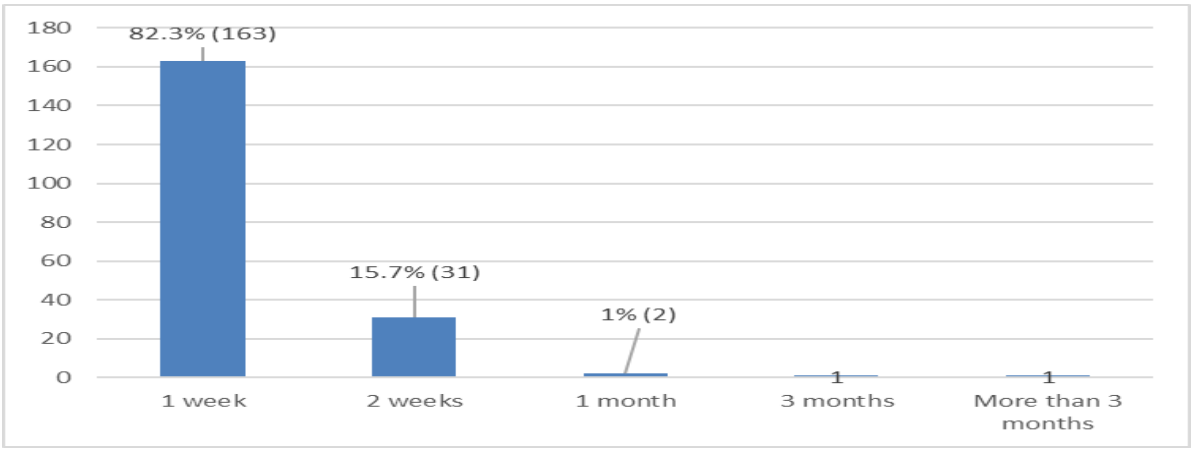

Figure 27.2: Attitudes and practices of people in Alsalam IDPs camp for those who have a persistent cough without blood and wait for some time how many they wait; November 2021, N = 198.

Attitudes and practices of people in Alsalam IDPs camp for those who have a persistent cough without blood and wait for sometime how long they wait; there were 49.7% (198) of people answered that they wait for some time before consulting a health care provider if they have a persistent cough without blood. Of these 198; 82.3% (163) wait for one week and 15% (31) wait for 2 weeks and there 2% (4) wait from one to more than three months.

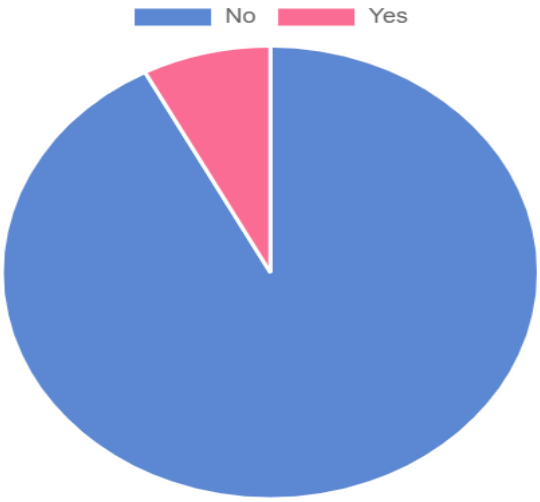

Figure 28.1: The knowledge of Alsalam IDPs about the presence of TBMU at the camp, South Darfur State, November 2020, N = 401.

The knowledge of Alsalam IDPs about the presence of TBMU at the camp; there is 92.3% (370) of the interviewed people do not know that there a TBMU at the camp, and only 7.7% (31) said there a TBMU at the camp.

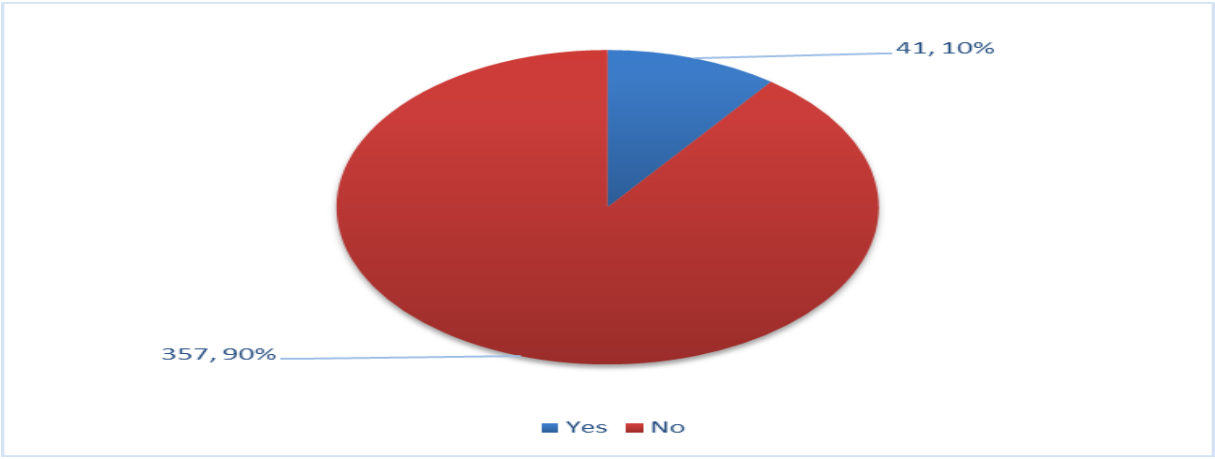

Figure 28.2: The knowledge of Alsalam IDPs about the presence of TBMU at the camp, South Darfur State, November 2021, N = 398.

The knowledge of IDPs about the presence of TBMU at the camp in the second part of the study; there are 90% of the interviewed people do not know that there was a TBMU at the camp, while 10% said there was a TBMU at the camp.
Comparison: There is a 2.3% increase in the knowledge of the IDPs that there is a TBMU at the camp.

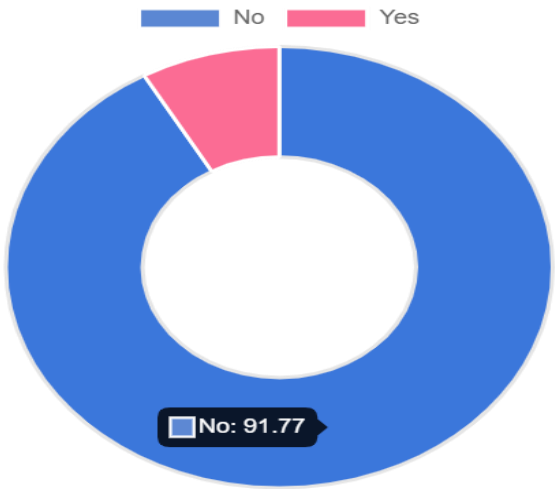

Figure 29.1: The knowledge of IDPs in Alsalam camp about the availability of the free diagnosis of TB; South Darfur State, November 2020, N = 401.

The knowledge people about the availability of the free diagnosis of tuberculosis at Alsalam IDPs camp; there is 91.8% (368) of people answered they do not know that there a free of charge diagnosis of TB in Alsalam camp and only 8.2% (33) answered that they know there a free of charge diagnosis of TB at the camp.

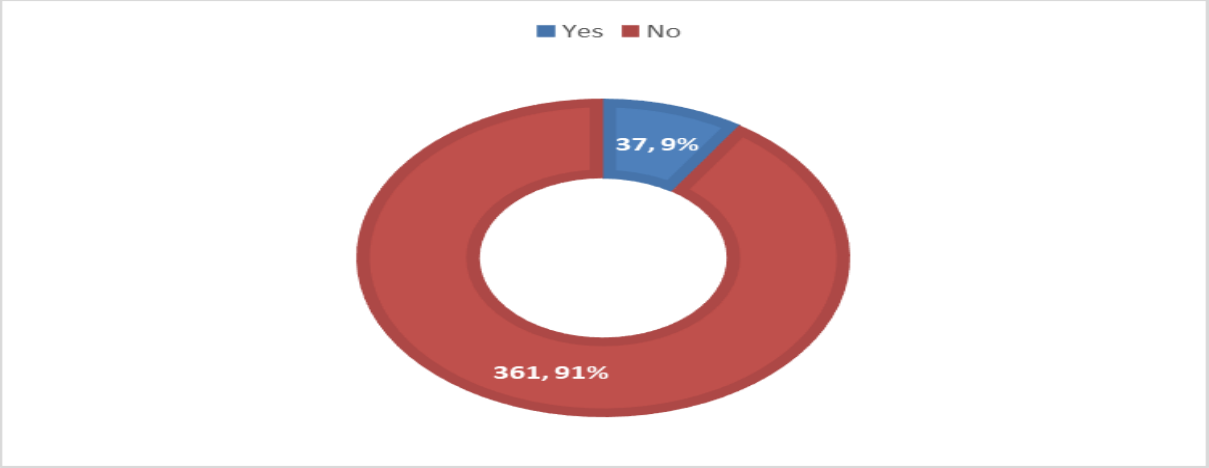

Figure 29.2: The knowledge of IDPs in Alsalam camp about the availability of the free diagnosis of TB; South Darfur State, November 2021, N = 398.

The knowledge of IDPs in Alsalam camp about the availability of the free diagnosis of tuberculosis in the second part of the study; there are 91% (361) of people answered they do not know that there a free of charge diagnosis of TB in Alsalam camp and only 9% (37) answered that they know there a free of charge diagnosis of TB at the camp.

Comparison: There is only a 1% different positive change in the knowledge of the availability of the free treatment.

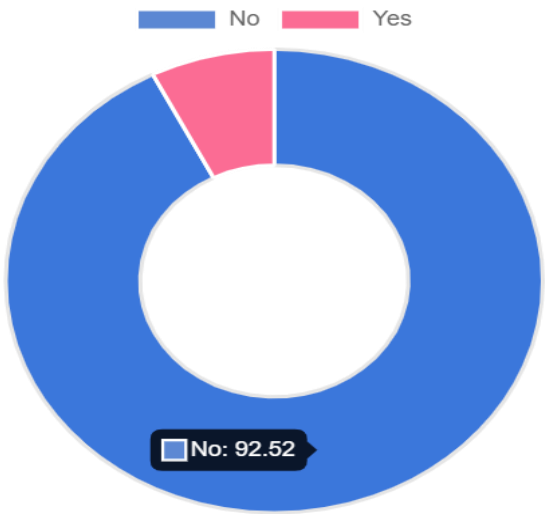

Figure 30.1: The knowledge of IDPs in Alsalam camp about the availability of the free tuberculosis treatment SD State, November 2020, N = 401.

The knowledge people about the availability of the free treatment of TB at Alsalam IDPs camp; there is 92.52% (371) of people answered they do not know that there is a free of charge treatment for TB in Alsalam camp and only 7.48% (30) answered that they know there a free of charge treatment for TB at the camp.

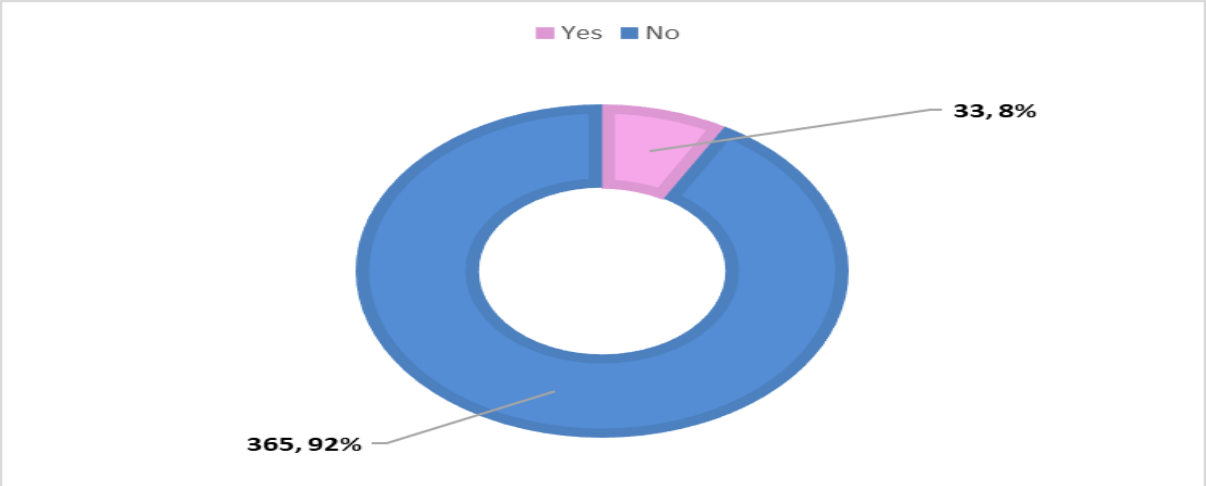

Figure 30.2: The knowledge of IDPs in Alsalam camp about the availability of the free TB treatment; South Darfur State, November 2020, N = 398.

The knowledge of IDPs in Alsalam camp about the availability of the free treatment of tuberculosis in the second part of the study; there are 92% (365) of people answered they do not know that there is a free of charge treatment for TB in Alsalam camp and only 8% (33) answered that they know there a free of charge treatment for TB at the camp.

Comparison: No change was noticed between the two studies.

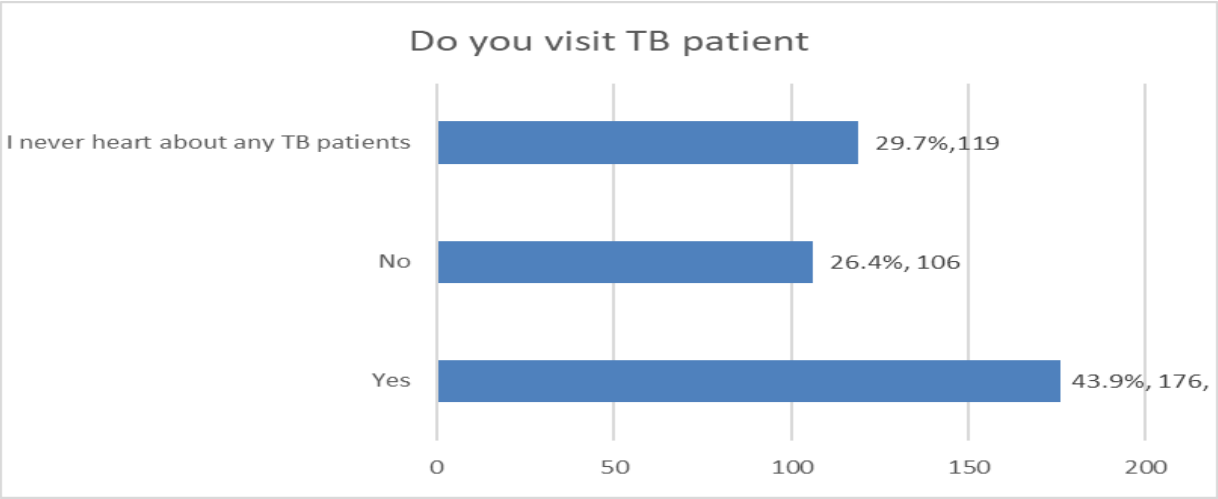

Figure 31.1: The knowledge, attitudes, and practices of Alsalam IDPs if they visit patient with TB; South Darfur State, November 2020, N = 401.

The knowledge, attitudes, and practices of Alsalam IDPs when they visit a TB patient with tuberculosis at Alsalam IDPs camp; 43.9% (176) of the sample size answered they visit TB patients if any, while 29.7% of respondents said they never heard about any TB patient, and 26.4% (106) answered never visit a TB patient.

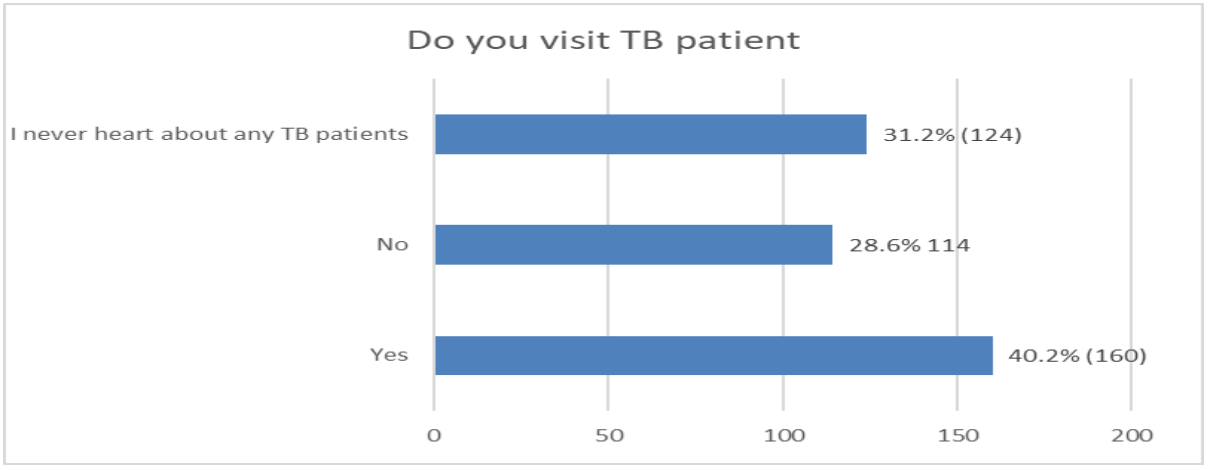

Figure 31.2: The knowledge, attitudes and practices of Alsalam IDPs if they visit patient with TB; South Darfur State, November 2021, N = 398

The knowledge, attitudes, and practices of Alsalam IDPs when they visit a TB patient with TB; 40.2% of the sample size answered they visited TB patients if any, while 31.2% of respondents said they had never heard about any TB patient, and 28.6% answered they never visit a TB patient.

Comparison: There is a 3.5% positive different to reduce the visit to TB patients between the two parts, the same time increase in the refusal to visit a TB patient.

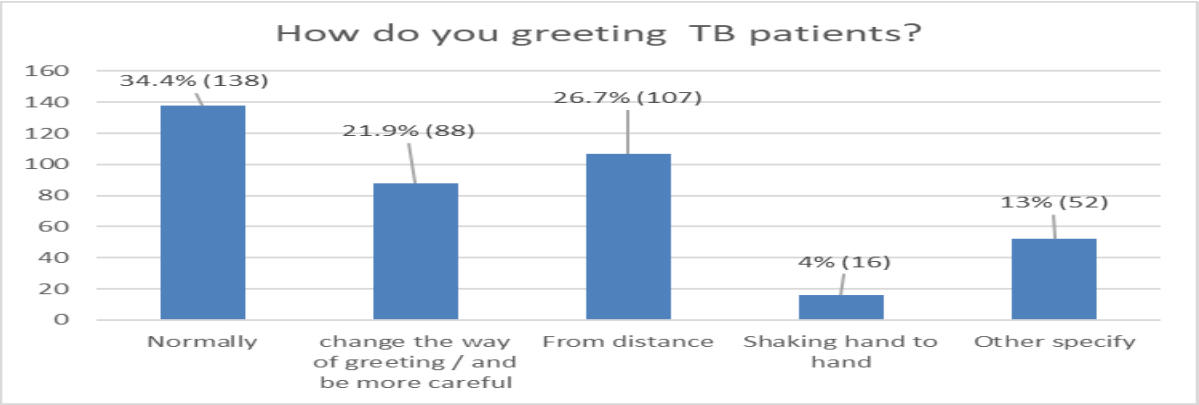

Figure 32.1: The KAP of people how they greet patients, Nov 2020. N=401.

There a 34.4% (138) answered they greet TB patient normally, 26.7% (107) said do greet from distance and 21.9% (88) of respondents change the way of greeting / and be more careful, in the other hand 4% (16) of people normally shaking hand to hand to greet patients, there was 13% (52) of respondents mentioned have another way of greetings to TB patients like a phone call or avoid the visit.

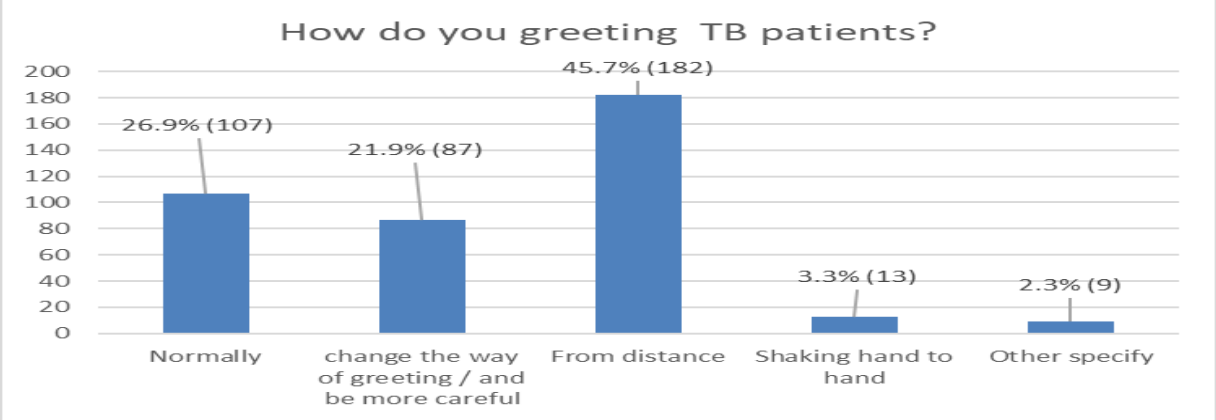

Figure 32.2: The KAP of IDPs in how they greet TB patient Nov 21, N = 398.

26.9% answered that they greet TB patients normally, while 45.7% greet TB patients from distance and there a 21.9% of respondents change their way of greeting / and be more careful, in another hand 3.3% of people normally shake hand to hand to greet TB patients and there a 2.3% of respondents mentioned there is another way of greetings to TB patients like phone call or avoid the visit.

Comparison: Positive cooping to decrease contact with patients increased, the percentage to greet TB patients normally decreased, and more than 20% increase in people greeting TB patient from distance in the second part of the study after intervention.

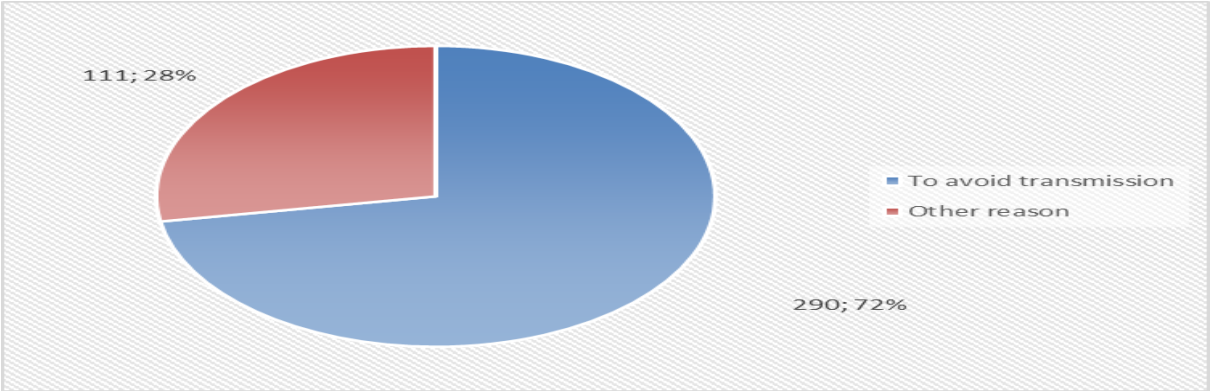

Figure 33.1: Why use specific way of greeting TB patients, Nov 2020, N = 401.

There were 72.3% (290) of people answered that they changed their way of greeting TB patient to avoid TB transmission while there are 27.7% (111) other people have another reason why selected their way of greetings some of them answered because they believe in Allah no infection, can greet normal, others see TB is not an infectious disease, and others see have social believes they have to greet TB patient normally there also some people answered they do not know the way of TB transmission or they do not know about the disease itself.

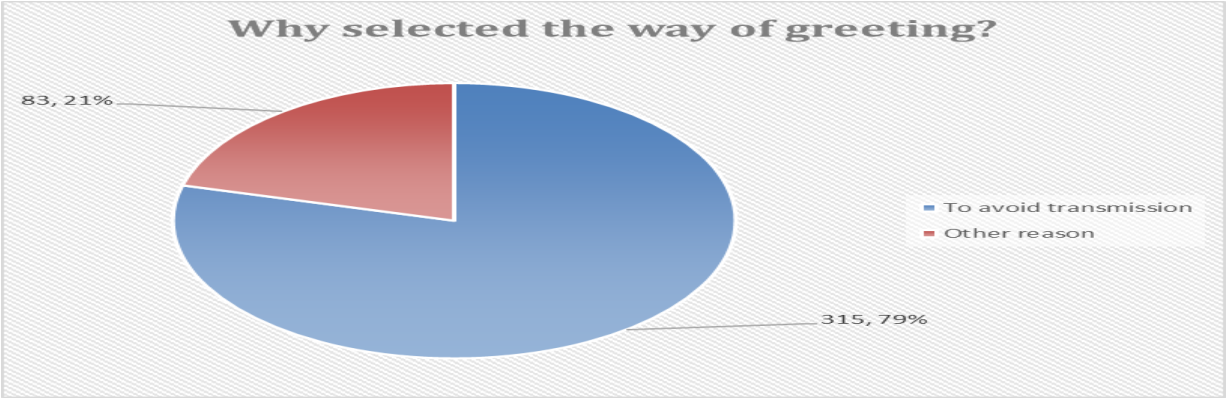

Figure 33.2: Why use specific way of greeting TB patient, Nov 2020, N = 401.

In the second; 79% (315) of people changed their way of greeting TB patient to avoid TB transmission, while there are 21%(83) other people have another reason some of them answered because they believe in Allah; that no infection then can greet normally, others see TB is not an infectious disease, some others have social believes they have to greet TB patient normally, some IDPs do not know the way of TB transmission or they do not know about the disease itself.

Comparison: There is a 7% difference in improving the way of contact with the patient to avoid TB transmission.

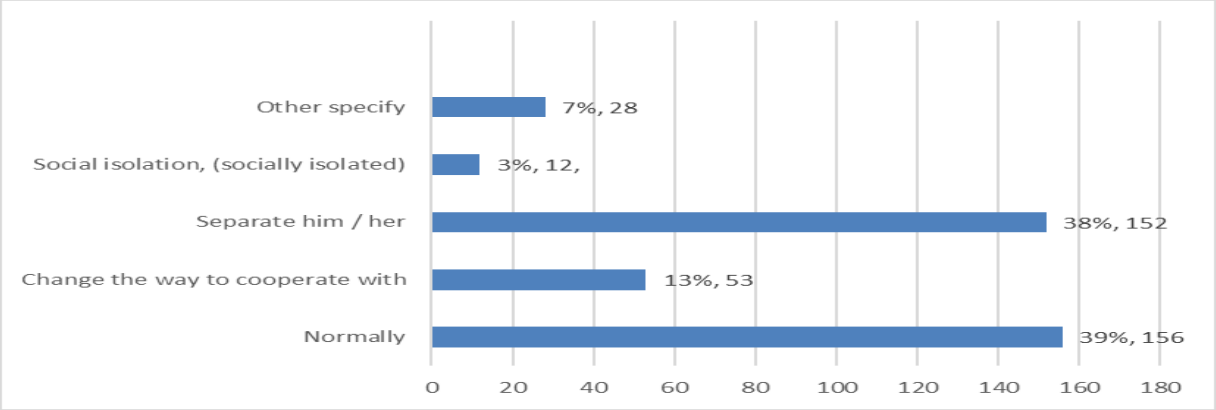

Figure 34.1: KAP of families and their reaction with the TB patient family member at the Alsalam IDPs cam, November 2020, N = 401.

38.9%(156) of families react normally and close percentage 37.9% (152) of families separate TB patients from other HH members, 13.2%(53) of families change the way of cooperation with TB patients, while 7%(28) of families another way of reactions and most of them do not know how to cooperate with TB patient, there less percentage 3%(12) of the families react to isolate patient socially.

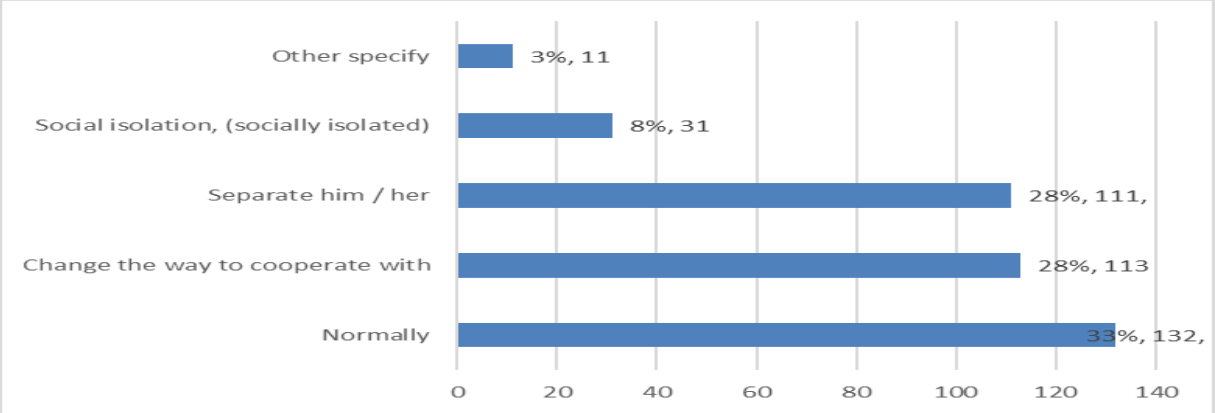

Figure 34.2: KAP of families, their reaction with the TB patient family member at Alsalam IDPs camp; November 2021N = 398.

In the second part; 33% (132) of families react normally to TB patients, 28% of families separate TB patients from other family members and same percentage change their way of cooperation with TB patients, while 8% of the families react to isolate patient socially, there 3% of families use another way of reactions and most of them answered do not know how to cooperate with TB patients.

Comparison: 15% positive increase in people change way of cooperation with patient to avoid transmission, negative practice observed in patient social isolation or separation.

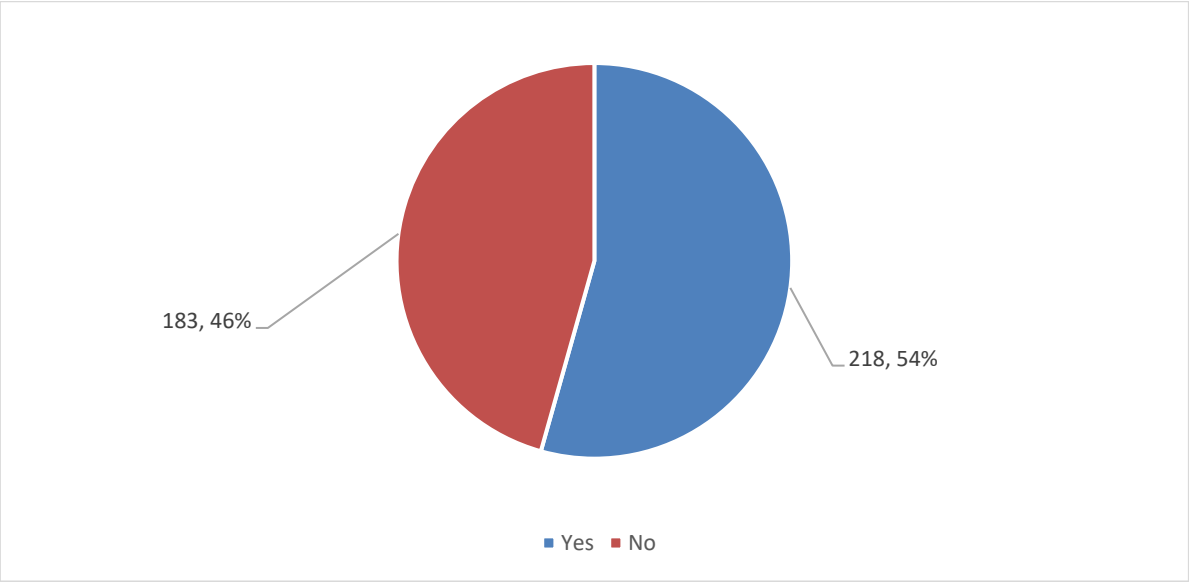

Figure 35.1: Knowledge, attitudes and practices of families and their interaction with the TB patients in the camp; SD, November 2020, N = 401.

Families under the study asked if they change the interaction with TB patients or not 54.4% (218) of people answered they change the interaction with TB patient while 45.6% (183) do not change the interaction with TB patient.

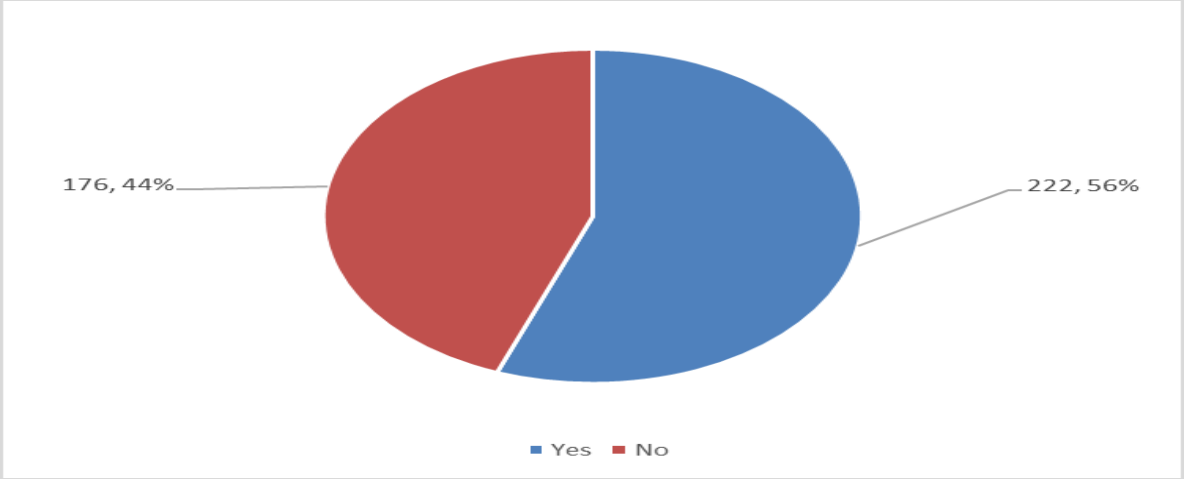

Figure 35.2: Knowledge, attitudes and practices of families and their interaction with the TB patients in the camp; South Darfur State, November 2021, N = 398.

Families under the study asked if they change the interaction with TB patients or not 56% (222) of people answered they change the interaction with TB patient while 454% (176) do not change the interaction with TB patient.

Comparison: No notable change observed between the two studies.

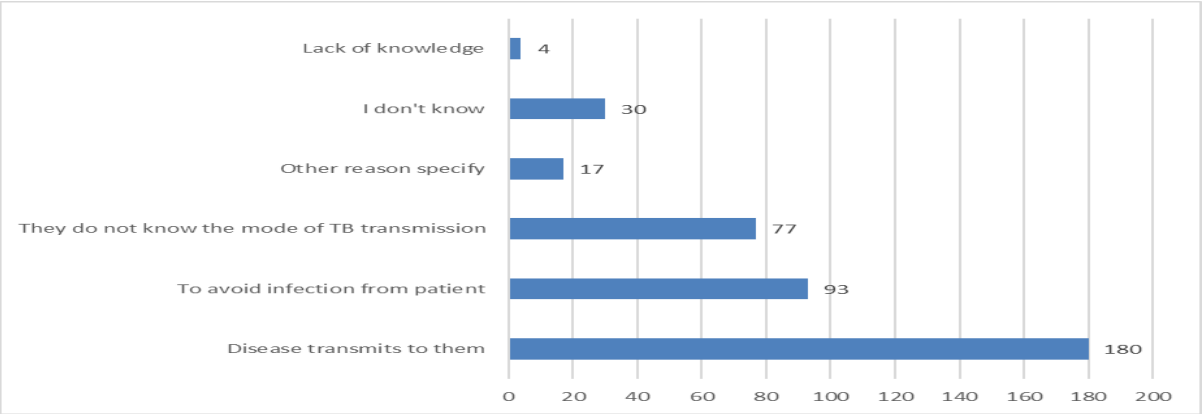

Figure 36.1: KAP of families, reasons why they change their interaction with the TB patients at Alsalam IDPs camp, November 2020, N = 401.

44.9% (180) believe that disease transmit to them, 23% (93) people change this to avoid infection from patient, 19.2% (77) answered that they do not know TB mode of transmission, while 8.5% (34) answered that they do not know the reason or lack of knowledge and there only 4.2% (17) mentioned there are other reasons mentioned like they do not change the way of cooperation or the believe in Allah.

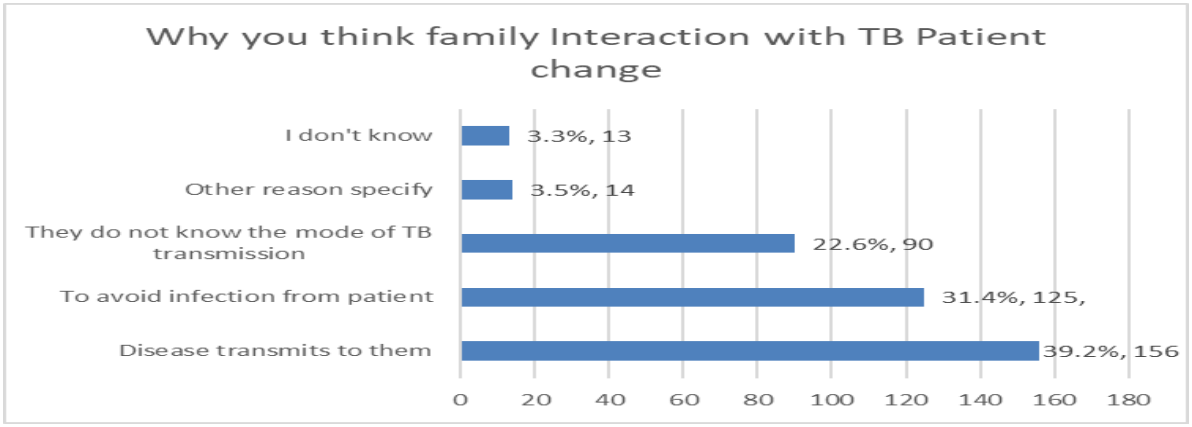

Figure 36.2: KAP of families the reasons why they change their interaction with the TB patients at Alsalam IDPs camp, November 2021, N = 398.

39.2% (156) believe that disease transmit to them, 31.4% (125) people change this to avoid infection from patient, 22.6% (90) answered that they do not know TB mode of transmission, while 3.3% (13) answered that they do not know the reason or lack of knowledge and there only 3.5% (14) have other reasons mentioned like they do not change the way of cooperation or the believe in Allah.

Comparison: No notable change to be addressed.

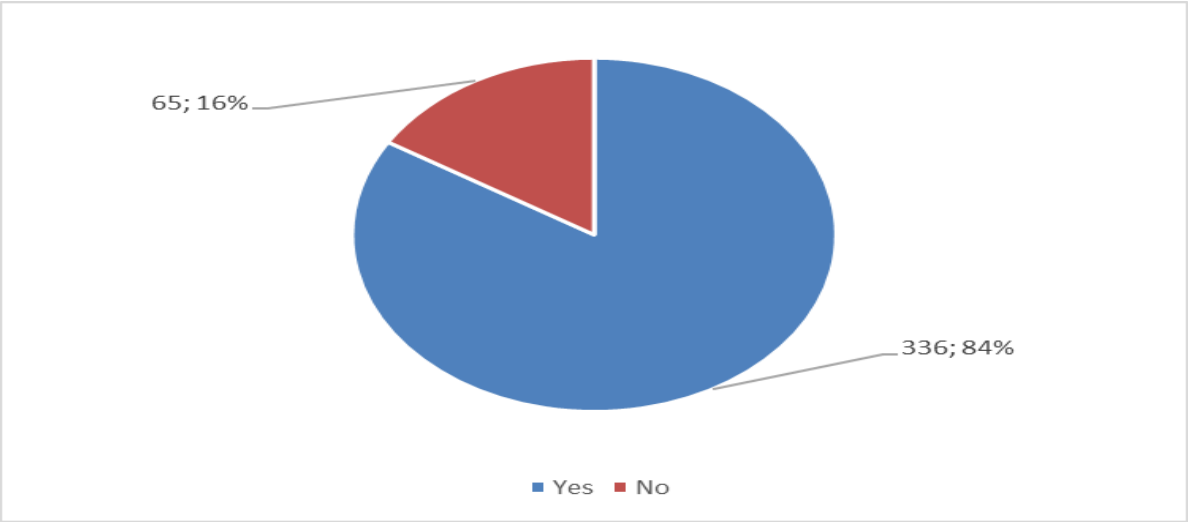

Figure 37.1: Knowledge, attitudes and practices of Alsalam IDPs if they are infected with TB do, they inform others like coworkers and others; South Darfur State, November 2020, N = 401.

The result showed 83.8% (336) of people inform others if they infected with TB and 16.2% (65) answered that they do not inform others if they infected with TB.

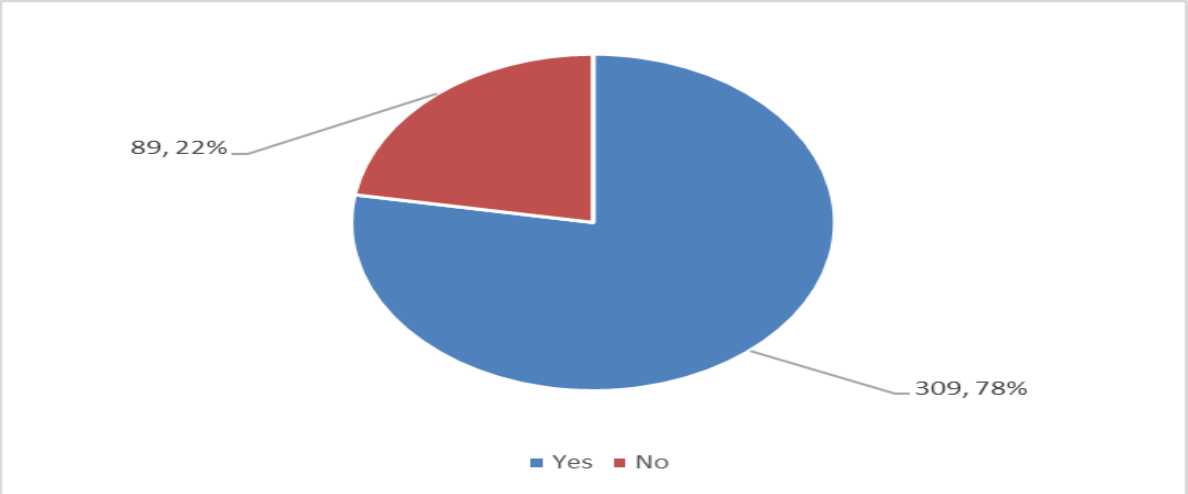

Figure 37.2: Knowledge, attitudes and practices of Alsalam IDPs if they are infected with TB do, they inform others like their coworkers and others at Alsalam IDPs camp; South Darfur State, November 2021, N = 398.

The result showed that 78% (309) of people inform others if they infected with TB and 22%(89) answered that they do not inform others if they infected with TB.

Comparison: There is a negative result compared the two studies before and after intervention the difference is 6%.

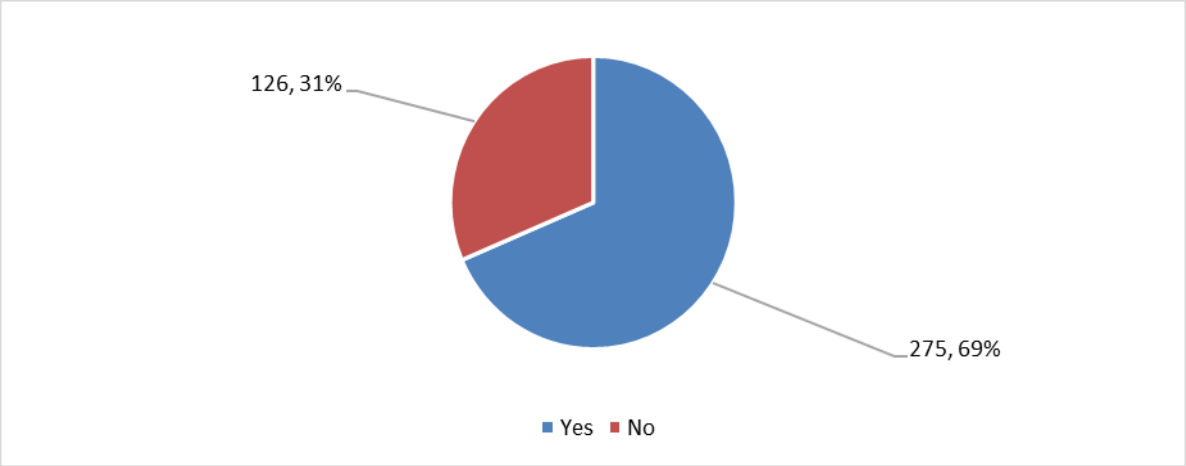

Figure 38.1: Knowledge, attitudes and practices of people in Alsalam if they are infected with TB do they believe others like their coworkers or friends visit them at Alsalam IDPs camp; SD State, November 2020, N = 401.

In the first part of the study 69% (275) believe that others like coworkers and friends do visit them when they infected with TB, while 31% (126) believe that others like coworkers and friends do not visit them when they infected with TB.

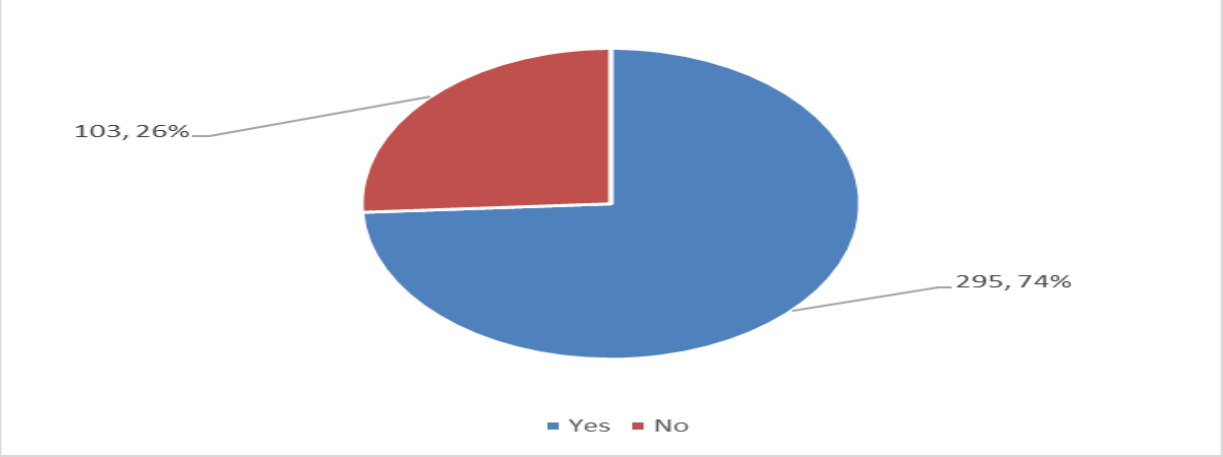

Figure 38.2: Knowledge, attitudes, and practices of people in Alsalam if they infected with TB do, they believe others like their coworkers or friends visit them at Alsalam IDPs camp; SD State, November 2021, N = 398.

In the second part of the study, 74% (295) believe others like coworkers and friends do visit them if they are infected with TB, 26% (103) believe that others like coworkers and friends do not visit them when they are infected with TB.

Comparison: Positive difference was observed in the second part of the study by 5% that the perception that people and friends can visit the patient.

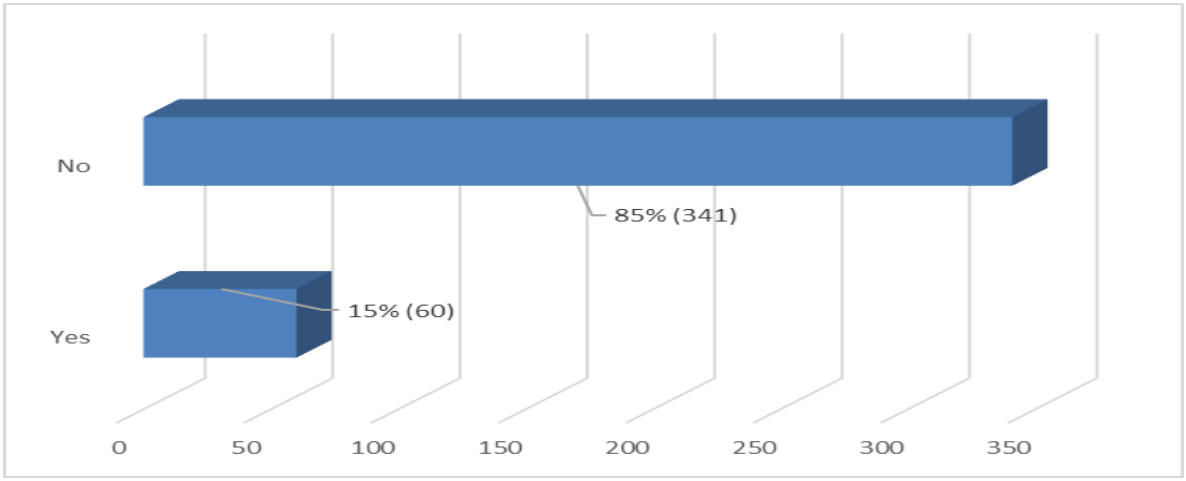

Figure 39.1: Knowledge, attitudes, and practices of people in Alsalam if there a relationship between TB and other disease, November 2020, N = 401.

85% (341 of study people believe that there is no relationship between TB and any other diseases, on the other hand, there was a 15% (60) of people see that there a relationship between TB and other diseases.

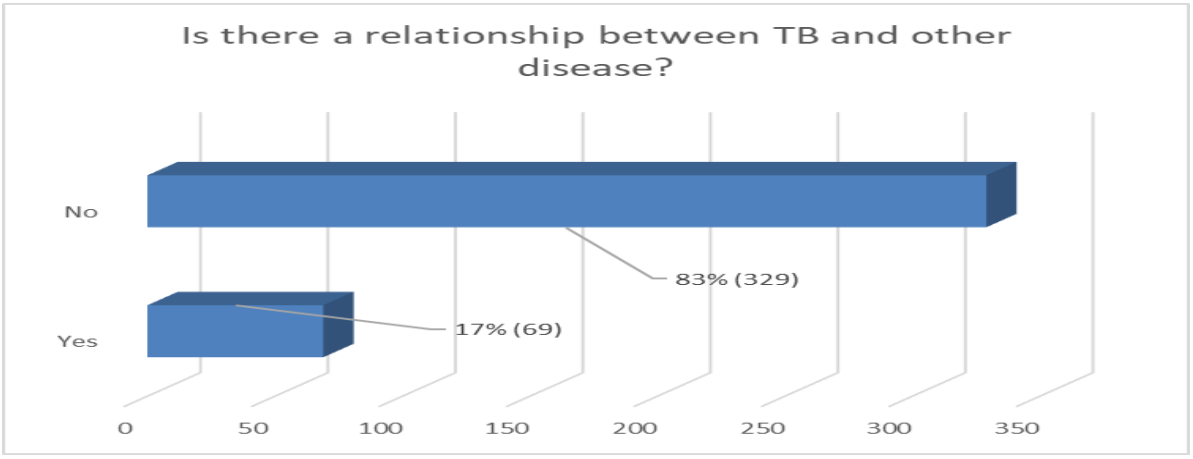

Figure 39.2: Knowledge, attitudes and practices of people in Alsalam if there a relationship between TB and other disease, November 2021, N = 398.

In the second part of the study, 83% (329) of study people believe that there is no relationship between TB and any other diseases, in the other hand, there a 17% (69) of people see that there a relationship between TB and other diseases.

Comparison: Knowledge of people increased by 2% of those who see there a relationship between TB and other diseases.

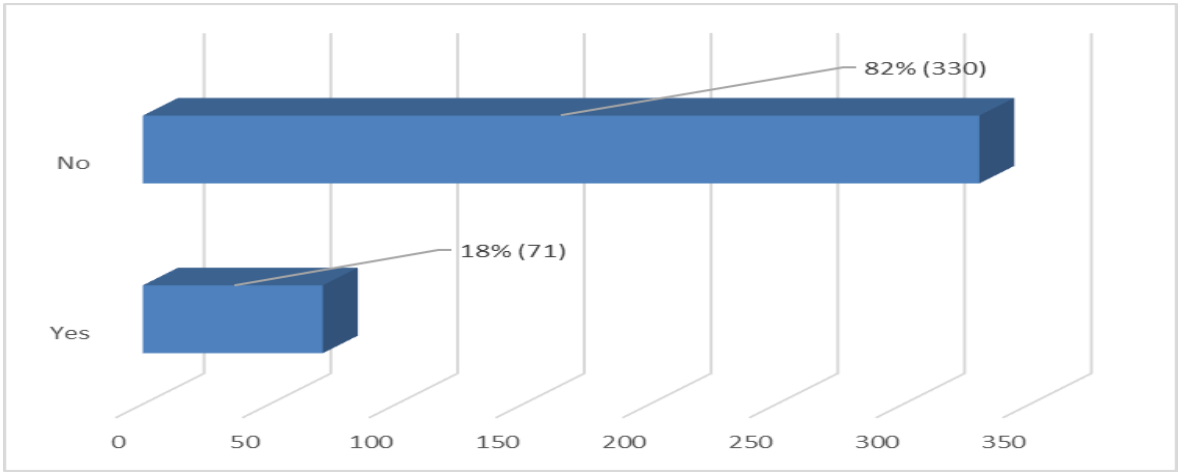

Figure 40.1: Tuberculosis awareness messages among Alsalam IDPs, South Darfur State, November 2020, N = 401.

The study population were asked if they received any TB health Education sessions; only 17.7% (71) answered that they have received Health Education Messages regarding TB at the camp, and the biggest percentage 82.3% (330) did not receive any health education messages related to TB.

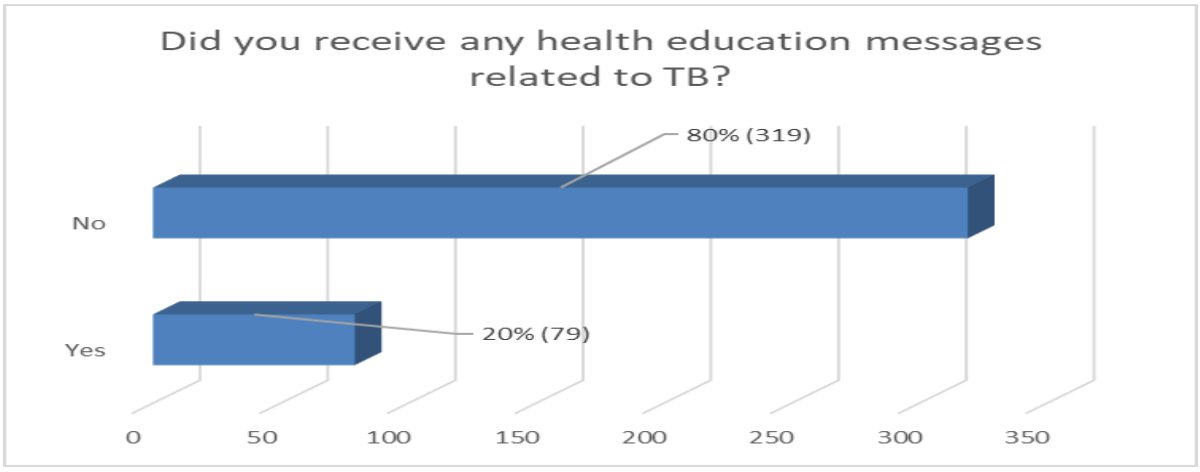

Figure 40.2: Tuberculosis awareness messages among Alsalam IDPs; South Darfur State, November 2021, N = 398.

The study population were asked if they received any TB health Education sessions; only 20% (79) answered that they have received Health Education Messages regarding TB at the camp, and the biggest percentage 80% (319) did not receive any health education messages related to TB.

Comparison: Percentage increase of people who received health education or awareness messages by 2.3%.

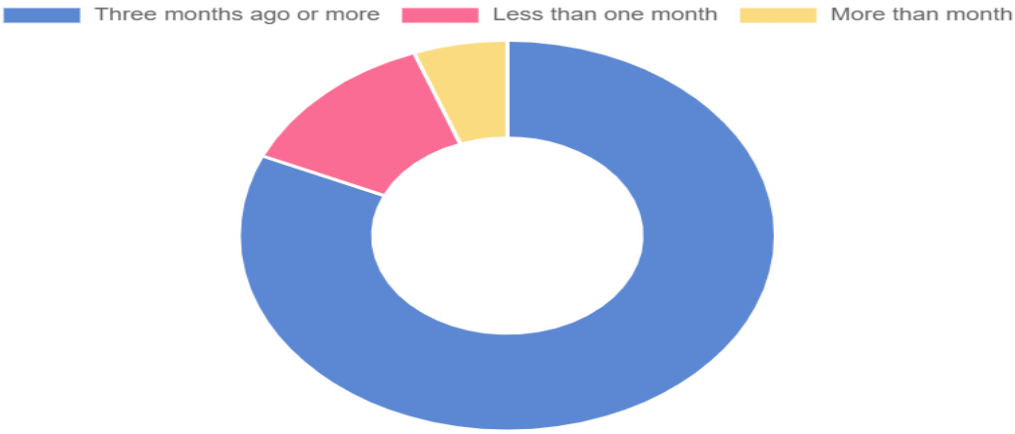

Figure 41.1: When is the Tuberculosis awareness messages received among Alsalam IDPs who have received TB awareness massages; South Darfur State, November 2020, N = 71.

When is the Tuberculosis awareness messages received among Alsalam IDPs who have received TB awareness massages at Alsalam IDPs camp; of the 71 those who have received awareness message of TB; 81.7% (58) received the messages three months ago or more, and 12.7% (9) received the messages in less than a month, while only 5.6% (4) received messages in more than a month.

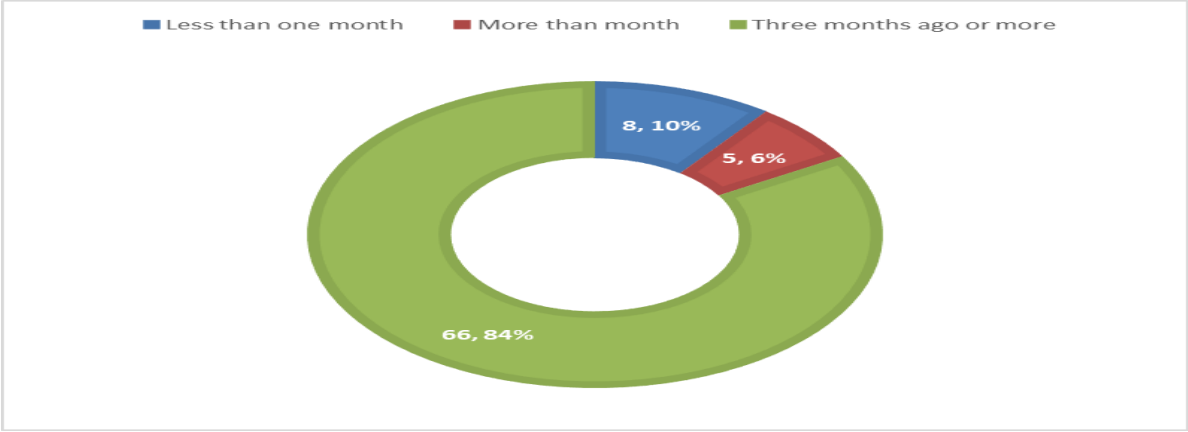

Figure 41.2: When is the Tuberculosis awareness messages received among Alsalam IDPs who have received TB awareness massages at Alsalam IDPs camp; South Darfur State, November 2021, N = 79.

Of the 79 who have received awareness messages of TB; 84% (66), received the messages three months ago or more, and 10% (8) received the message in less than a month, while only 6% (5) received a message in more than a month.

Comparison: Nothing to be compared between the two studies.

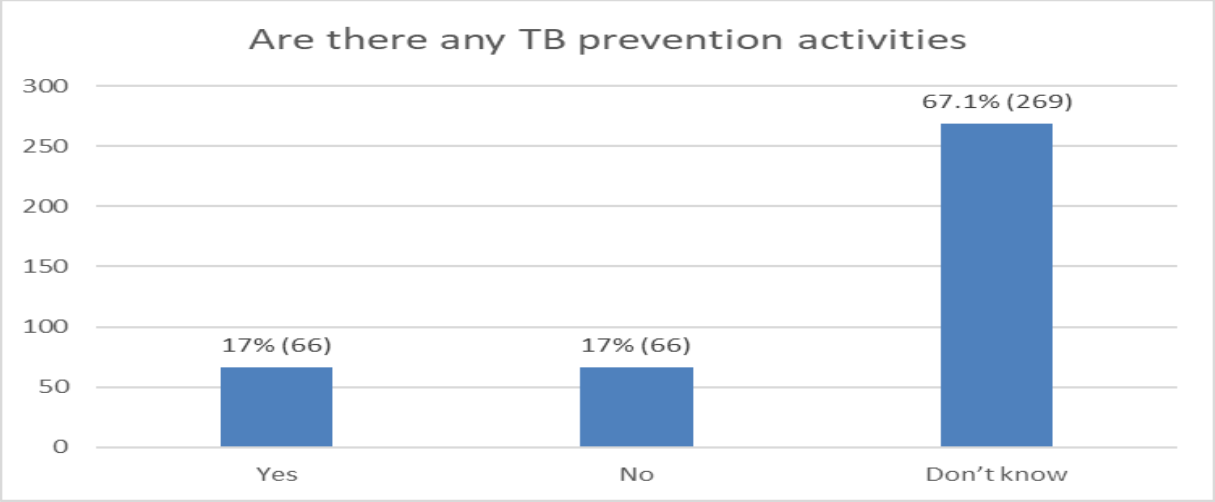

Figure 42.1: Knowledge attitudes and practices of IDPs if they know there are TB prevention activities running in the camp; November 2020, N = 401.

There is 67.1% (269) of the sample size don't know if there are TB preventive activities in the camp, there almost an equal percentages of those said there is no TB activities 17% and 16% among those who said there a TB prevention activities in the camp.

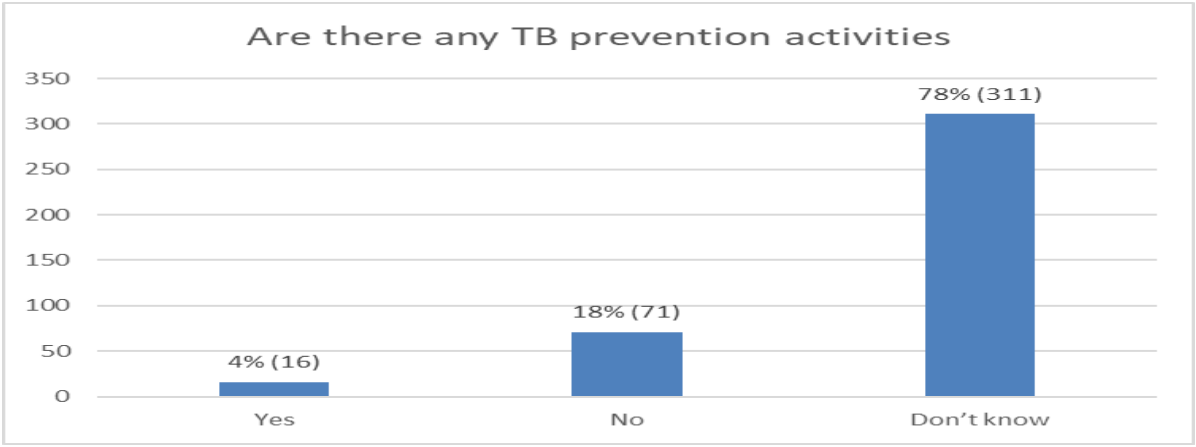

Figure 42.2: Knowledge attitudes and practices of IDPs if they know there are TB prevention activities running in the camp; November 2021, N = 398.

In the second part of the study there are 78% (311) of the sample size don't know if there a TB preventive activity in the camp, while 18% (71) said there are no TB activities and only 4% said there a TB prevention activity in the camp.

Comparison: Although there is a health education was conducted, and messages sent to a community in the topics still the result is less after the intervention.

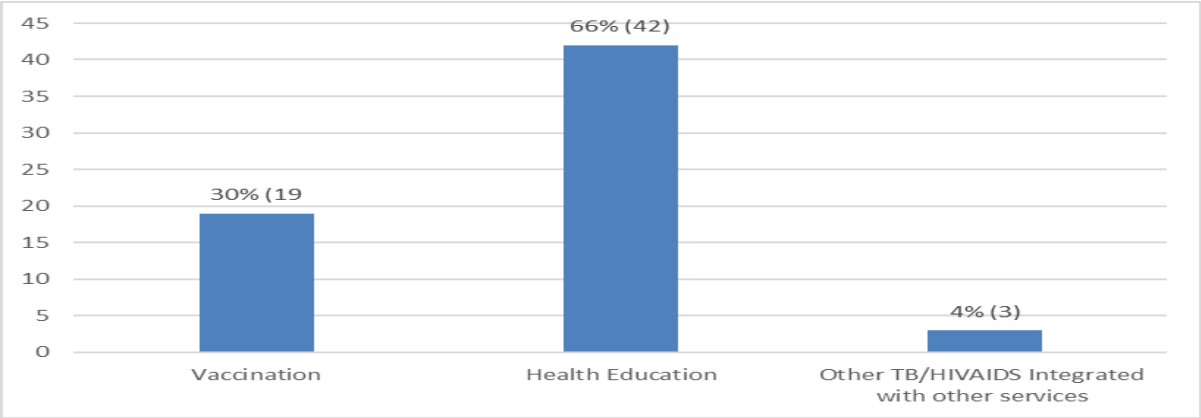

Figure 43.1: KAP of IDPs on type of preventive activities among those who said there are TB prevention activities in the camp, Nov 2020, N = 64.

There are 66% (42) of the 64 who said there are preventive activities in the camp said the type of preventive activities is health education, and 30% (19) vaccination is one of the preventive activities at the camp, while only 4% (3) they see there are other prevention activities integrated with TB/HIV activities or with other services and program like COVID19.

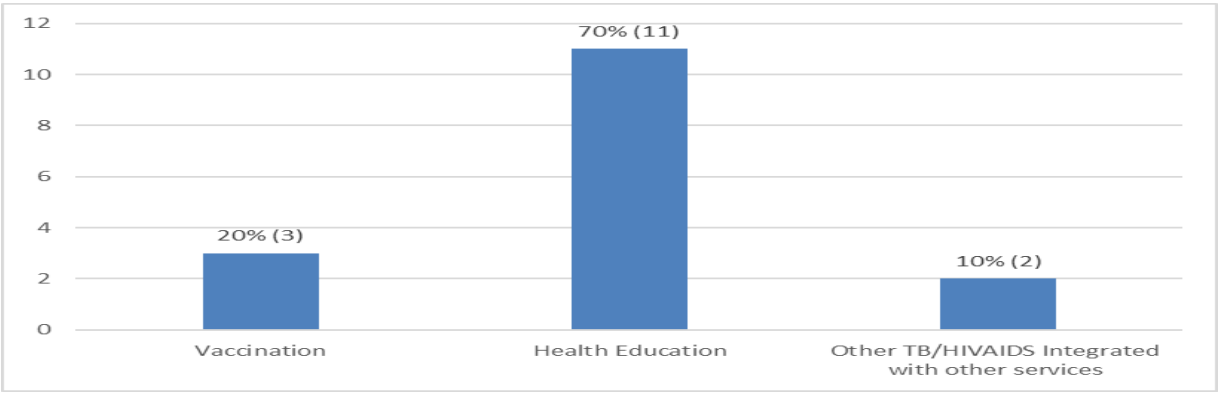

Figure 43.2: KAP of IDPs on type of preventive activities among those who said there are TB prevention activities in the camp; November 2021, N = 16.

In the second part of the study there are 70% (11) of the 16 who said there are preventive activities in the camp said the type of preventive activities is health education, and 20% (3) vaccination is one of the preventive activities at the camp, while 10% (2) they see there are other prevention activities integrated with TB/HIV activities or with other services and program like COVID19.

Comparison: Health education activities increased by 4% from 66% to 70% although the absolute figure is decreased in the second part of the study.

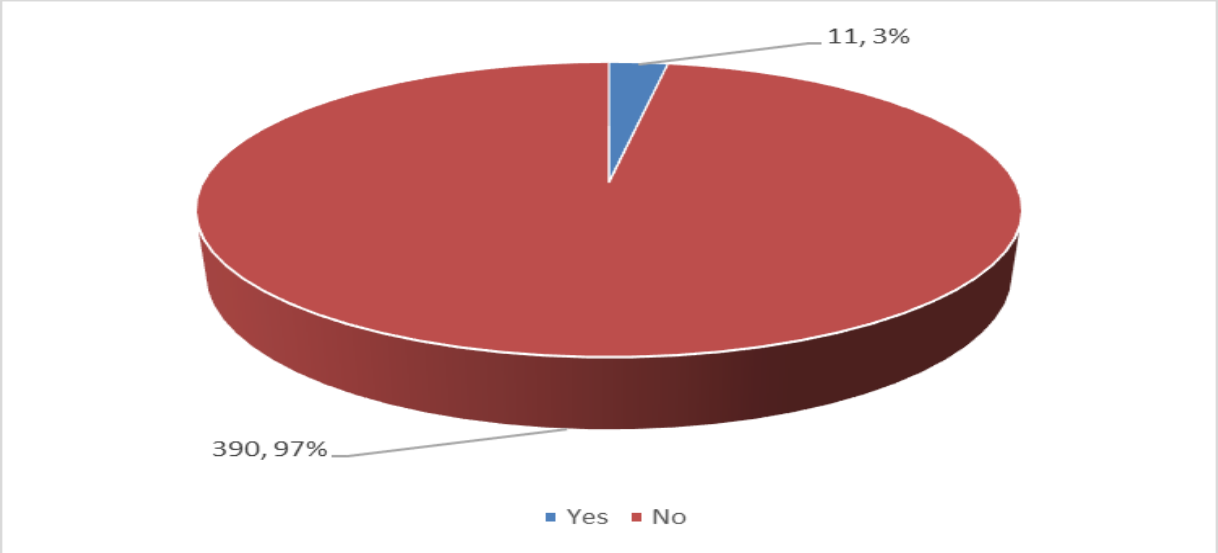

Figure 44.1: History of the interviewed IDPs with other diseases (diabetes) at Alsalam IDPs camp; South Darfur State, November 2020, N = 401.

History of the interviewed IDPs with other diseases (diabetes) at Alsalam IDPs camp; out of 401 sample size, there are 3% (11) diabetics, while 97% (390) none.

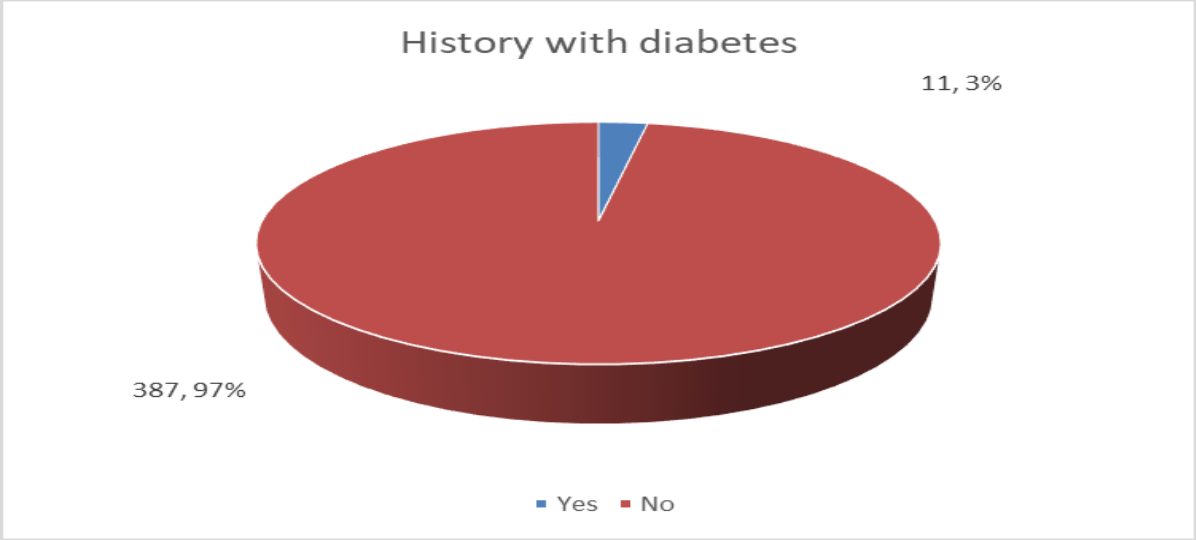

Figure 44.2: History of the interviewed IDPs with other diseases (diabetes) at Alsalam IDPs camp; South Darfur State, November 2021, N = 398.

History of the interviewed IDPs with other diseases (diabetes) at Alsalam IDPs camp in the second part of the study; out of 398 sample size, there are 3% (11) diabetics, while 97% (387) none.

Comparison: Exact percentage no change between the two studies.

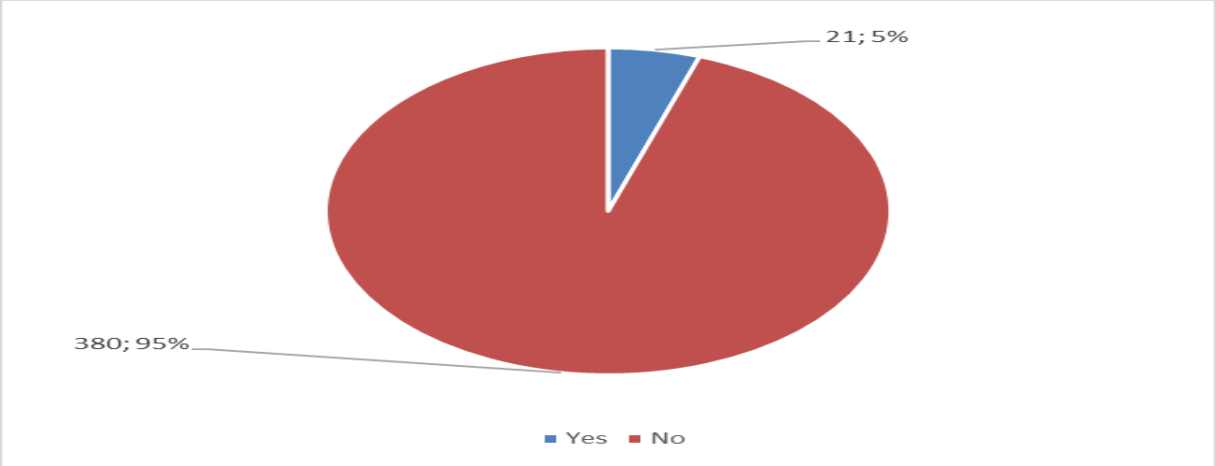

Figure 45.1: History of interviewed IDPs with other diseases (hypertension) at Alsalam IDPs camp; South Darfur State, November 2020, N = 401.

A history of the interviewed IDPs with other diseases (hypertension) at Alsalam IDPs camp; out of 401 sample size, there is a 5% (21) have a history of hypertension, while 95% (380) have none.

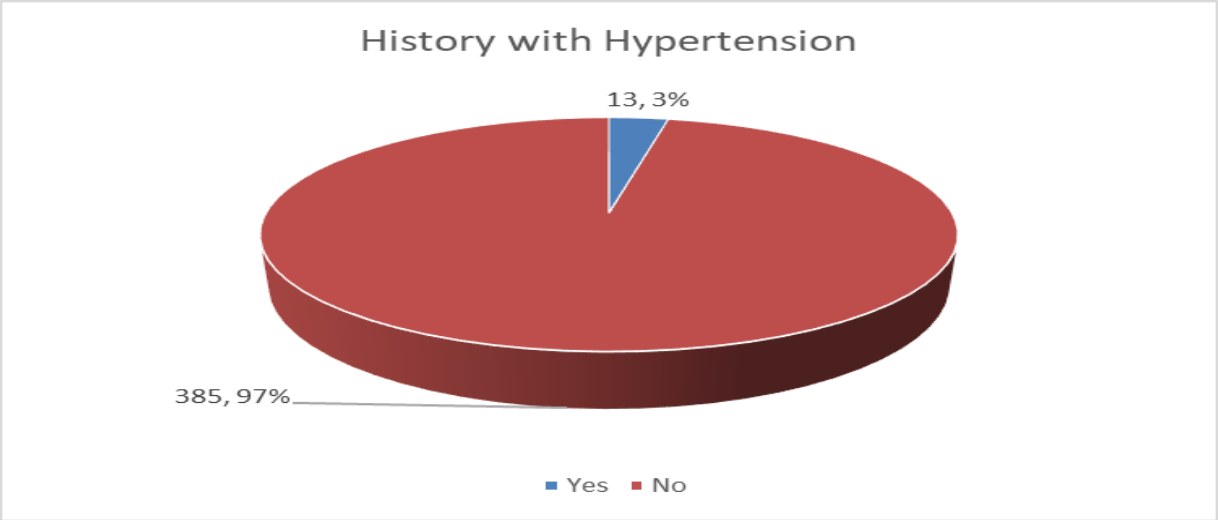

Figure 45.2: History of the interviewed IDPs with other diseases (hypertension) at Alsalam camp; SD State, November 2021, N = 398.

A history of the interviewed IDPs with other diseases (hypertension) at Alsalam IDPs camp; out of 398 sample size, there is 3% (13) have a history of hypertension, while 97% (385) none.

Comparison: The different of hypertension is a 2% decrease in the second part.

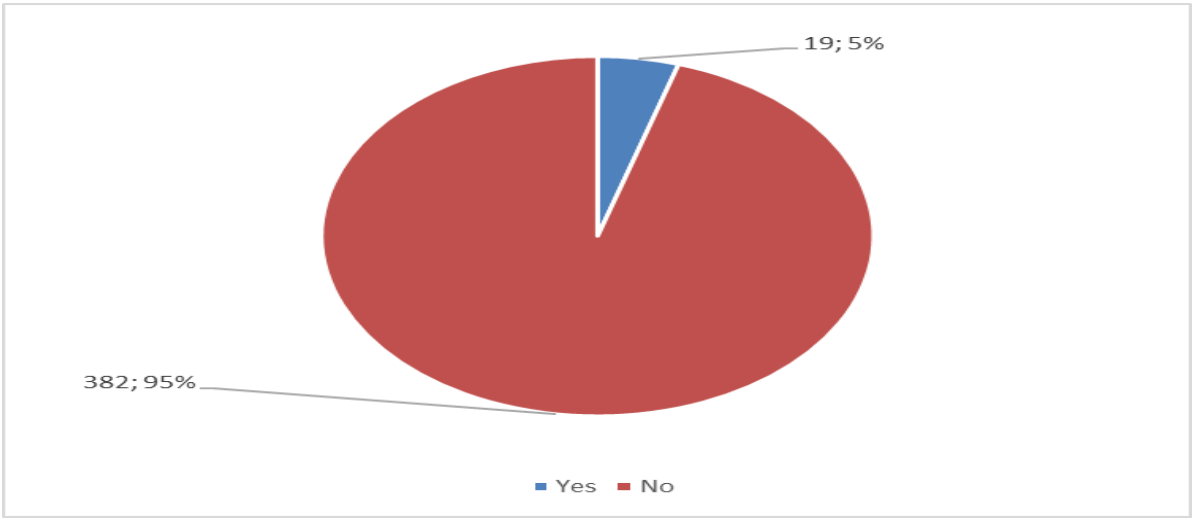

Figure 46.1: History of the interviewed IDPs with other diseases (Asthma) at Alsalam IDPs camp; South Darfur State, November 2020, N = 401.

History of the interviewed IDPs with other diseases (Asthma) at Alsalam IDPs camp; out of 401 sample size, there is a 5% (19) have a history of Asthma, while 97% (382) have none.

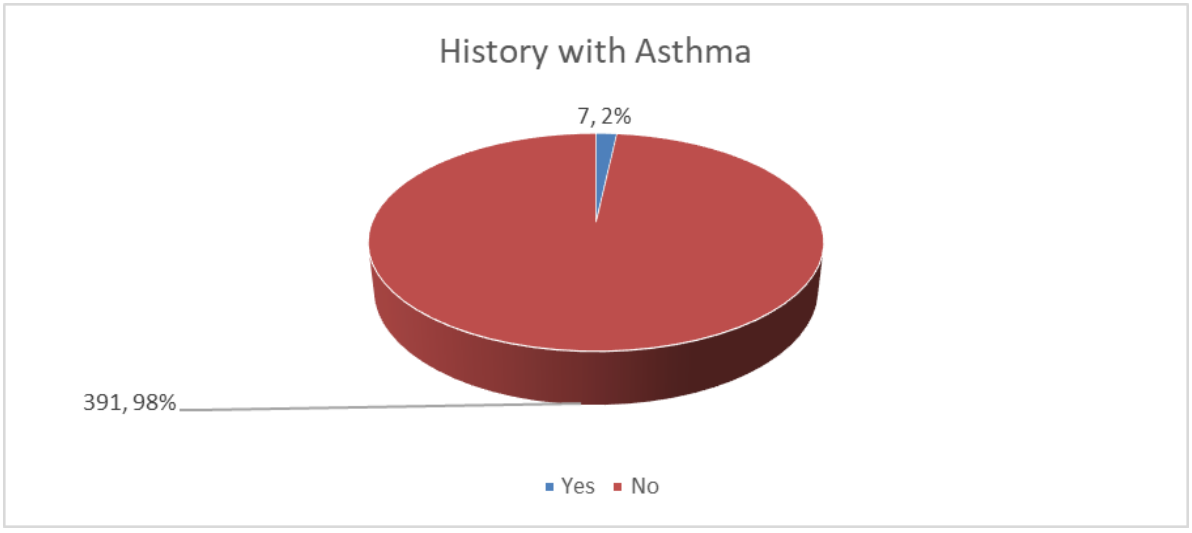

Figure 46.2: History of the interviewed IDPs with other diseases (Asthma) at Alsalam IDPs camp; South Darfur State, November 2021, N = 398.

The history of the interviewed IDPs with other diseases (Asthma) at Alsalam IDPs camp; out of 398 sample size, there is 2% (7) have a history of Asthma, while 98% (391) have none

Comparison: The different of Asthma is a 3% decrease in the 1st part of the study compared to the 2nd part.

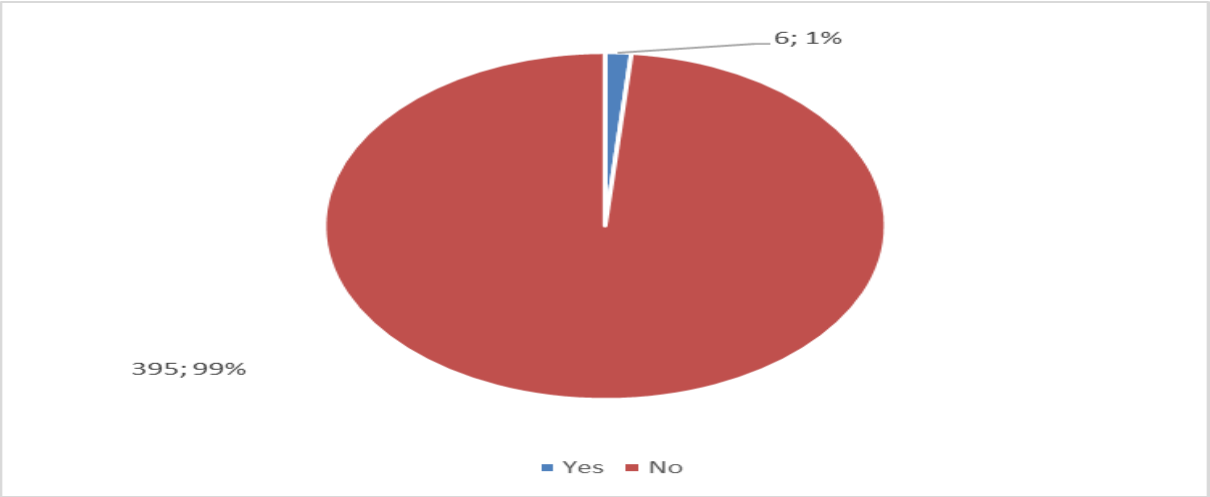

Figure 47.1: History of the interviewed IDPs with TB before or living with HIV/AIDS at Alsalam IDPs camp; SD, November 2020, N = 401.

Out of 401 sample size, there is 1% (6) had a history of TB before, while 99% (395) did not. While this are a very small percentage of people living with HIV/AIDS among the interviewed IDPs only 0.5% (2).

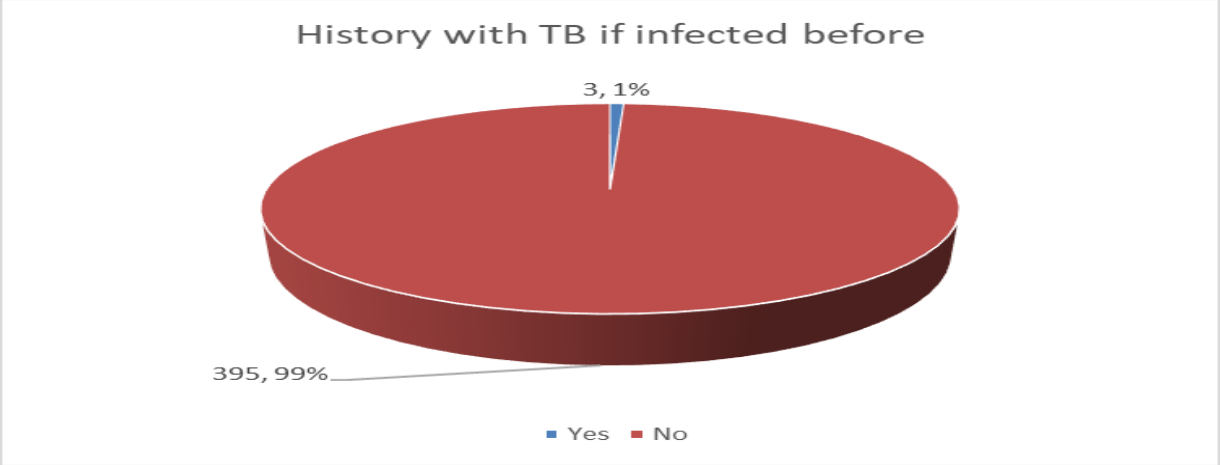

Figure 47.2: History of the interviewed IDPs with TB before or living with HIV/AIDS at Alsalam IDPs camp; SD State, November 2021, N = 398.

Out of 398 sample size, there is 1% (3) had a history with tuberculosis before, while 99% (395) did not. While the percentage of HIV/AIDS among the interviewed IDPs is 1.3% (5).

Comparison: The history of TB is same between the two parts although HIV/AIDS is more in the second part 1.3% compared to 0.5 in the 1st part.

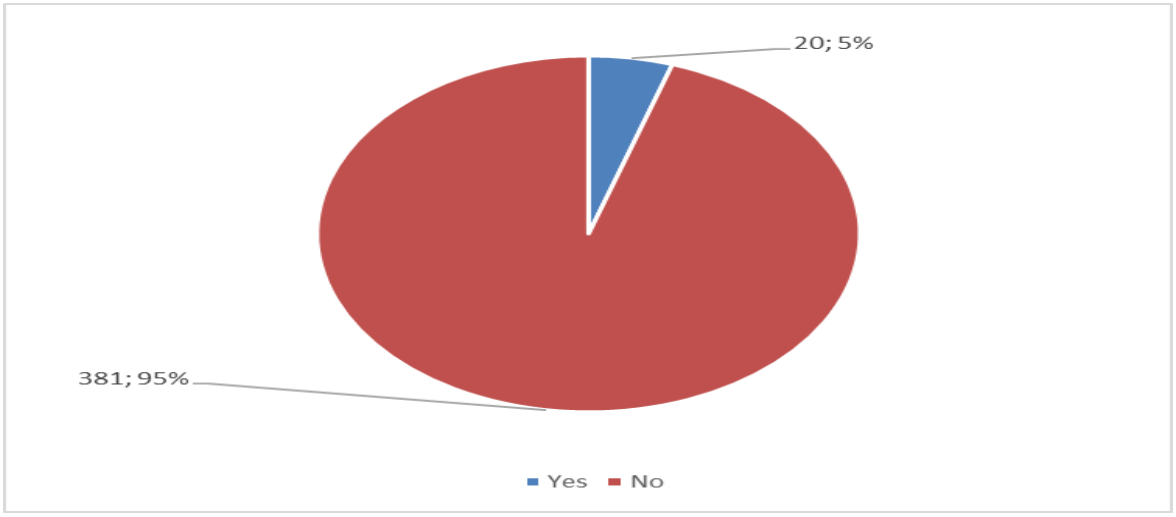

Figure 48.1: TB risk factors; history of the interviewed IDPs with any kind of malnutrition at Alsalam IDPs camp; SD State, November 2020, N = 401.

Out of 401 sample size, there is 5% (20) have a history with one type of malnutrition like micro nutrient deficiency, underweight, anemia etc, while 95% (381) have no history with any type of malnutrition.

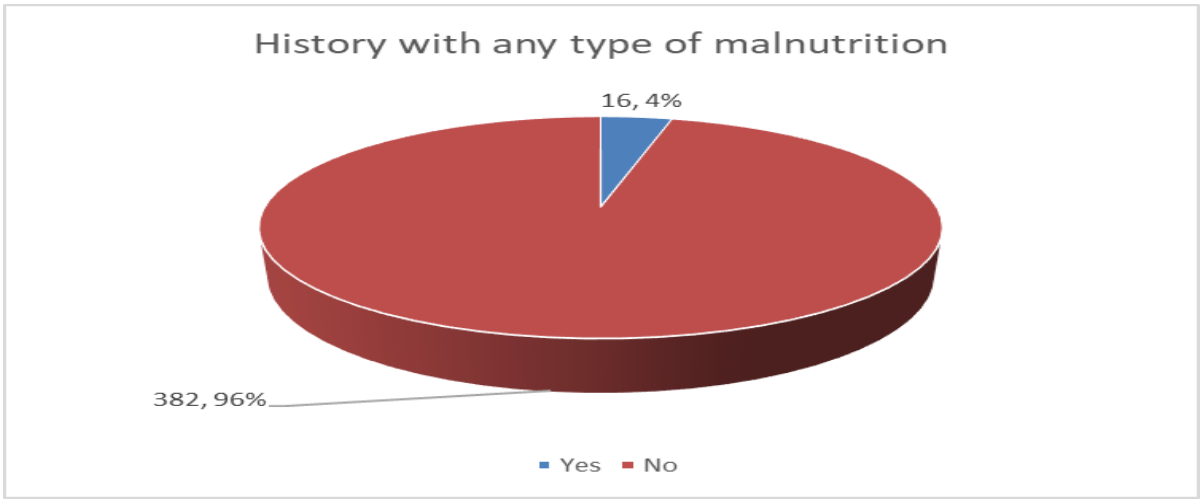

Figure 48.2: TB risk factors; history of the interviewed IDPs with any kind of malnutrition at Alsalam IDPs camp; SD State, November 2021, N = 398.

Out of 398 sample size, there is 4% (16) have a history with one type of malnutrition like micronutrient deficiency, underweight, anemia etc, while 96% (382) have no history with any type of malnutrition.

Comparison: No significance deference was noticed between the two studies.

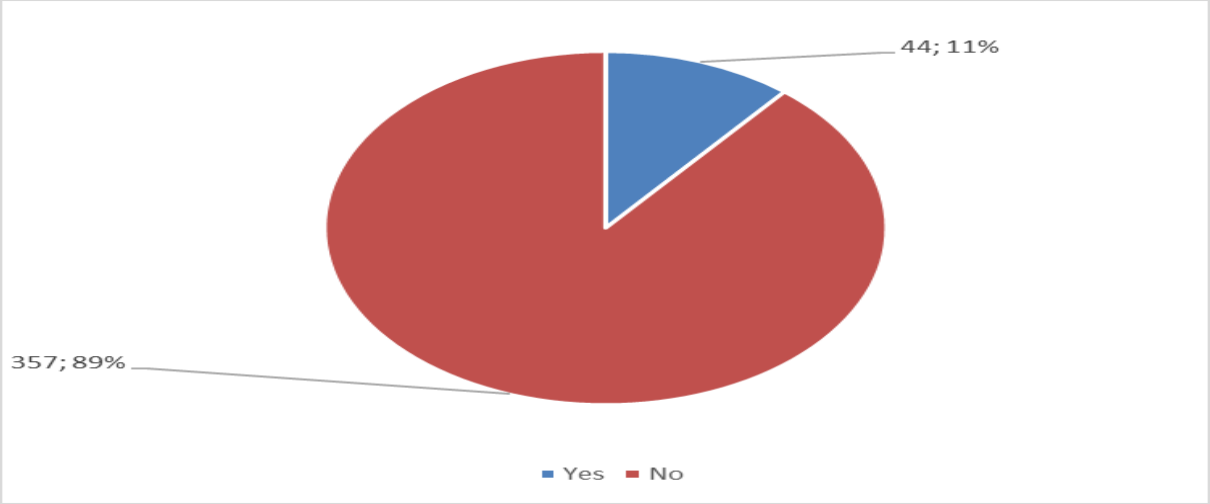

Figure 49.1: TB risk factors; history of the interviewed IDPs with smoking at Alsalam IDPs camp; South Darfur State, November 2020, N = 401.

Out of 401 sample size, there are 11% (44) smokers currently or previously smokers, while 89% (357) have no history of smoking.

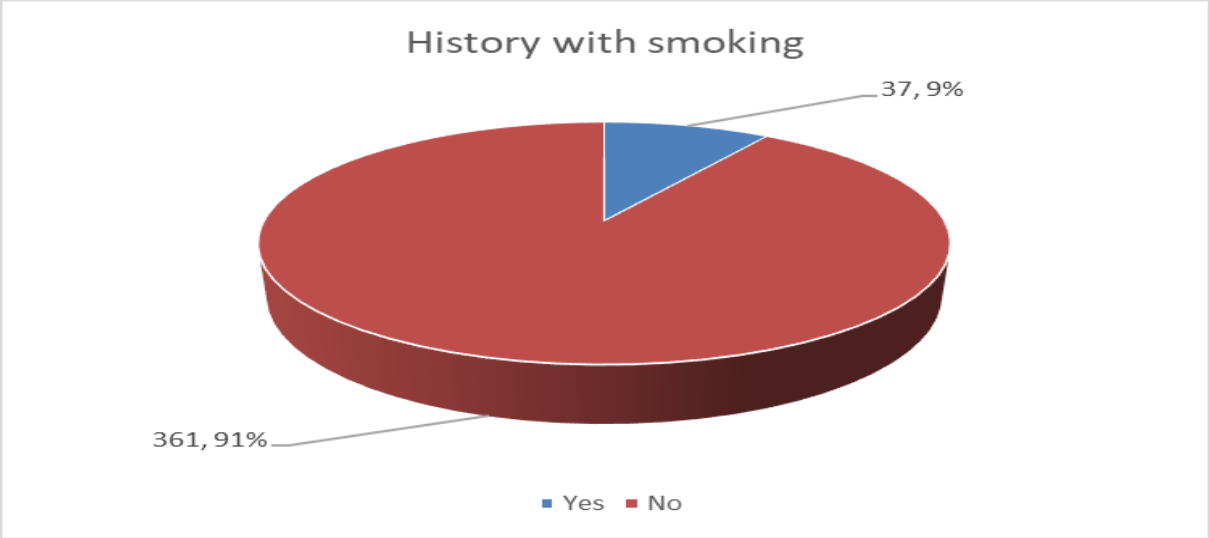

Figure 49.2: TB risk factors; history of the interviewed IDPs with smoking at Alsalam IDPs camp; South Darfur State, November 2021, N = 398.

In the second part of the study; out of the 398 sample size, there are 9% (37) smokers currently or previously smokers, while 91% (361) have no history of smoking.

Comparison: The different is less smokers by 2% in the second part of the study compared to the 1st part of the study.

Table 4.1: Risk factors of TB; history of interviewed IDPs with COVID19 at Alsalam IDPs camp; South Darfur State, November 2020, N = 401.

History with COVID-19					
History with COVID-19		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	3	.7	.7	.7
	No	398	99.3	99.3	100.0
	Total	401	100.0	100.0	

There is 0.5% (3) have a history with COVID19, while 99.3% (398) have none.

Table 4.2: Risk factors of TB; history of the interviewed IDPs with COVID19 at Alsalam IDPs camp; South Darfur State, November 2021, N = 398.

History with COVID-19					
History with COVID-19		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	6	1.5	1.5	1.5
	No	392	98.5	98.5	100.0
	Total	398	100.0	100.0	

There is 1.5% (6) have a history with COVID19, while 98.5% (392) have none.

Comparison: There an increase in COVID19 percentage in the second part of the study.

Table 5: Cross tabulation between age groups and TB prevalence (smear positive) among the target population, at Alsalam camp; Nov 2020. N = 401

Age groups	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
10 -19 years	1	0.25%	50	12.47%	51	13%
20-29 years	2	0.50%	126	31.42%	128	32%
30-39 years	5	1.25%	76	18.95%	81	20%
40-49 Years	1	0.25%	55	13.72%	56	14%
50-59 years	0	0.00%	35	8.73%	35	9%
60 years and above	0	0.00%	50	12.47%	50	12%
Total	9	2.24%	392	97.76%	401	100%

X = 7.993 p. value = 0.157

The results showed high prevalence rate 1.25% among the age group 30 - 39 years, chi-square was 7.993, and the P. v was 0.157; no statistical relationship.

Table 6: Cross tabulation between Marital status and TB prevalence (smear positive) among the target population, at Alsalam camp; Nov 2020. N = 401

Marital status	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Never Married	5	1.25%	77	19.20%	82	20.45%
Married	4	1.00%	293	73.07%	297	74.06%
Divorced	0	0.00%	7	1.75%	7	1.75%
Widowed	0	0.00%	15	3.74%	15	3.74%
Total	9	2.24%	392	97.76%	401	100%

X = 7.145 p. value = 0.067

The results showed high prevalence rate 1.25% among never married people, chi-square was 7.145, and the p. value was 0.07; without significant statistic relationship.

Table 7: Cross tabulation between gender and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; Nov 2020.

N = 401

Gender	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Male	2	0.50%	133	33.17%	135	33.67%
Female	7	1.75%	259	64.59%	266	66.33%
Total	9	2.24%	392	97.76%	401	100%

X = 0.540 p. value = 0.462

The results showed high prevalence rate 1.75% among female participant, chi-square was 0.540, and the p. value was 0.462; without statistically significant.

Table 8: Cross tabulation between Education Level and TB prevalence (smear positive) among the target population, at Alsalam camp; Nov 2020.

N = 401

Education Level	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
None	4	1.00%	121	30.17%	125	31%
Khalwa	3	0.75%	101	25.19%	104	26%
Primary/ basic	2	0.50%	120	29.93%	122	30%
Secondary	0	0.00%	46	11.47%	46	11%
College Univ and above	0	0.00%	4	1.00%	4	1%
Total	9	2.24%	392	97.76%	401	100%

X = 2.066 p. value = 0.724

The highest prevalence rate 1% appeared among the illiterate; those never had any kind of education, chi-square was 2.066, and the p. value was 0.724; while the relationship statistically not significant.

Table 9: Cross tabulation between occupation and TB prevalence (smear positive) among Alsalam IDPs; SD State, Nov 2020. N = 401.

Occupation	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Labor daily	0	0.00%	52	12.97%	52	13%
Free work - labor	5	1.25%	137	34.16%	142	35%
Employed	0	0.00%	9	2.24%	9	2%
Unemployed	3	0.75%	152	37.91%	155	39%
Student	1	0.25%	42	10.47%	43	11%
Total	9	2.24%	392	97.76%	401	100%

X = 2.524 p. value = 0.640

The results showed high prevalence rate 1.25% among daily workers, chi-square was 2.524, and the p. value was 0.640, with no statistic significant.

Table 10: Cross tabulation between Family monthly income and TB prevalence (smear positive) among Alsalam IDPs; SD State, Nov 2020.

N = 401

Family monthly income	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Less than 1000 SDG	2	0.50%	71	17.71%	73	18%
From 1000 - 1499 SDG	0	0.00%	29	7.23%	29	7%
From 1500 to 1999 SDG	0	0.00%	18	4.49%	18	4%
From 2000 to 2499 SDG	0	0.00%	22	5.49%	22	5%
From 2500 to 2999 SDG	1	0.25%	41	10.22%	42	10%
More than 3000 SDG	6	1.50%	211	52.62%	217	54%
Total	9	2.24%	392	97.76%	401	100%

X = 1.937 p. value = 0.858

Family monthly income was excluded from study results and eventually the discussion due to high inflation and unstable in the prices.

Table 11: Cross tabulation between Number of people sleeping in a room and TB prevalence (S+) among the IDPs, at Alsalam, SD State, Nov 2020. N = 401

Number of people sleeping in a room	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
1	0	0.00%	8	2.00%	8	2%
2	2	0.50%	104	25.94%	106	26%
3	3	0.75%	129	32.17%	132	33%
4	2	0.50%	99	24.69%	101	25%
5	1	0.25%	27	6.73%	28	7%
6	0	0.00%	13	3.24%	13	3%
7	0	0.00%	10	2.49%	10	2%
8	0	0.00%	1	0.25%	1	0%
9	1	0.25%	0	0.00%	1	0%
10	0	0.00%	1	0.25%	1	0%
Total	9	2.24%	392	97.76%	401	100%

X = 44.632 p. value = 0.000

There significant relationship between number of people sleeping in a room and the prevalence rate of TB; it showed 0.75% among HHs where 3 person / room.

Table 12: Cross tabulation between Family HH head and TB prevalence (smear positive) among the Alsalam IDPs; SD State, Nov 2020. N = 401

Family HH head	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Father	6	1.50%	291	72.57%	297	74%
Mother	3	0.75%	58	14.46%	61	15%
Son	0	0.00%	29	7.23%	29	7%
Daughter	0	0.00%	9	2.24%	9	2%
Other external relative	0	0.00%	5	1.25%	5	1%
Total	9	2.24%	392	97.76%	401	100%

X = 3.043 p. value = 0.551

The results showed high prevalence rate 1.5% among father headed HHs, chi-square was 3.043, and the p. value was 0.551. No significant relationship.

Table 13: Cross tabulation between the previous infection of TB and the tuberculosis prevalence (smear positive) among the target population, at Alsalam IDPs camp; South Darfur State, November 2020

N = 401

Have you ever been infected with TB	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	1	0.25%	4	1.00%	5	1.25%
No	8	2.00%	388	96.76%	396	98.75%
Total	9	2.24%	392	97.76%	401	100%

X = 7.275 p. value = 0.007

The results showed significant relationship between TB prevalence and the previous infection with TB, chi-square was 7.275, and the p. value was 0.0.007.

Table 14: Cross tabulation between knowing someone who had been infected with TB and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; South Darfur State, November 2020.

N = 401

Do you know someone who has been infected with TB?	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	6	1.50%	75	18.70%	81	20.20%
No	3	0.75%	317	79.05%	320	79.80%
Total	9	2.24%	392	97.76%	401	100%

X = 12.332 p. value = 0.000

The relationship between knowing someone who has been infected with TB and TB prevalence (smear positive) among the target population, chi-square was 12.332, and the p. value was 0.000. The study showed a significant relationship.

Table 15: Cross tabulation between knowledge of how TB does spread and TB prevalence (smear positive) among Alsalam IDPs, Nov 2020. N = 401

How does TB spread?	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Cough (Air)	1	0.25%	99	24.69%	100	25%
Unclean food or water	2	0.50%	43	10.72%	45	11%
Contact in Public area	4	1.00%	21	5.24%	25	6%
Hereditary	0	0.00%	2	0.50%	2	0%
Don't know	2	0.50%	214	53.37%	216	54%
Other way specify	0	0.00%	13	3.24%	13	3%
Total	9	2.24%	392	97.76%	401	100%

X = 25.315 p. value = 0.000

The relationship between knowledge of how TB does spread and TB prevalence among the target population, chi-square was 25.315, and the p. value was 0.000. There is a significant relationship.

Table 16: Cross tabulation between knowledge of TB treatment outcome "recovery" after treatment and TB prevalence (smear positive) among the target population, at Alsalam camp; SD State, November 2020. N = 401

Is the recovery complete after taking treatment	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	3	0.75%	126	31.42%	129	32.17%
No	3	0.75%	24	5.99%	27	6.73%
Don't know	3	0.75%	242	60.35%	245	61.10%
Total	9	2.24%	392	97.76%	401	100%

X = 10.84 p. value = 0.004

There a significant relationship between TB prevalence and the knowledge of people under the study about the outcome of the treatment Chi-square was 10.84, and the p. value was 0.004.

Table 17: Cross tabulation between knowing that TB diagnosis / test is available for free at the camp and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; SD State, November 2020.

N = 401

Do you know that TB diagnosis / test is available for free?	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	4	1.00%	29	7.23%	33	8.23%
No	5	1.25%	363	90.52%	368	91.77%
Total	9	2.24%	392	97.76%	401	100%

X = 15.988 p. value = 0.000

Study showed significant relationship between knowing TB test availability in the cam and TB prevalence, Chi-square was 15.988, and the p. value was 0.000.

Table 18: Cross tabulation between receiving health education messages related to TB and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; South Darfur State, November 2020.

N = 401

Did you receive any health education messages related to TB?	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	4	1.00%	67	16.71%	71	17.71%
No	5	1.25%	325	81.05%	330	82.29%
Total	9	2.24%	392	97.76%	401	100%

X = 4.517 p. value = 0.034

Study showed significant relationship between receiving health education and TB prevalence among the study population, Chi-square was 4.517, and the p. value was 0.034.

Table 19: Cross tabulation between the knowledge of people about the treatment period and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; SD State, November 2020, N = 401.

How long TB treatment take	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Less than one month	1	0.25%	22	5.49%	23	6%
1 month	0	0.00%	10	2.49%	10	2%
2 months	0	0.00%	8	2.00%	8	2%
3 months	0	0.00%	12	2.99%	12	3%
6 months	1	0.25%	24	5.99%	25	6%
1 year	0	0.00%	20	4.99%	20	5%
Depends to the case and type	4	1.00%	28	6.98%	32	8%
Don't know	3	0.75%	268	66.83%	271	68%
Total	9	2.24%	392	97.76%	401	100%

X = 18.901 p. value = 0.009

Study showed significant relationship between knowing TB treatment period and TB prevalence Chi-square was 18.901, and the p. value was 0.009.

Table 20: Cross tabulation between people who has signs and symptoms, suspected TB case, send for test and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; SD State, Nov 2020. N = 401

There signs and symptoms, suspected case, send for test	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	9	2.24%	8	2.00%	17	4.24%
No	0	0.00%	384	95.76%	384	95.76%
Total	9	2.24%	392	97.76%	401	100%

X = 207.962 p. value = 0.000

Study showed statistically significant in the relationship between the suspected case and the TB prevalence, Chi-square was 207.962, and the p. value was 0.000.

Table 21: Cross tabulation between the presence of TB patients in the visited HHs for 6 months and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; South Darfur State, November 2020.

N = 401

Is there any TB patient in the household now or within the last 6 months?	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	4	1.00%	2	0.50%	6	1.50%
No	5	1.25%	390	97.26%	395	98.50%
Total	9	2.24%	392	97.76%	401	100%

X = 115.221 p. value = 0.000

There a significant relationship between the presence of patient in the visited HH during the last 6 months and TB prevalence Chi-square was 115.221, and the p. value was 0.000.

Table 22: Cross tabulation between other HH members who has signs and symptoms and considered a suspected TB case, sent for test and TB prevalence (smear positive) among target IDPs camp; SD State, Nov 2020.

N = 401

TB status (ask if there are symptoms with any HH member – if apply send for sputum test)	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	1	0.25%	3	0.75%	4	1.00%
No	8	2.00%	389	97.01%	397	99.00%
Total	9	2.24%	392	97.76%	401	100%

X = 9.536 p. value = 0.002

There was strong relationship between the presence of suspected person in the HH tested positive and the prevalence of TB, Chi-square was 9.536, and the p. value was 0.002.

Table 23: Cross tabulation previous infection with TB and tuberculosis prevalence (smear positive) among the target population, at Alsalam IDPs camp; South Darfur State, November 2020.

N = 401

Have you infected with TB before	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	1	0.25%	5	1.25%	6	1.50%
No	8	2.00%	387	96.51%	395	98.50%
Total	9	2.24%	392	97.76%	401	100%

X = 5.775 p. value = 0.016

Study showed significant relationship between TB infection and the TB prevalence, Chi-square was 5.775, and the p. value was 0.016.

Table 24: Cross tabulation between History with Hypertension and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; South Darfur State, November 2020.

N = 401

History with Hypertension	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	3	0.75%	18	4.49%	21	5.24%
No	6	1.50%	374	93.27%	380	94.76%
Total	9	2.24%	392	97.76%	401	100%

X = 14.645 p. value = 0.000

Study showed significant relationship between the history of hypertension and the prevalence of TB, Chi-square was 14.645, and the p. value was 0.000.

Table 25: Cross tabulation between Asthma and TB prevalence (smear positive) among the target population, at Alsalam IDPs camp; SD State, November 2020.

N = 401

History with Asthma	TB status (if there are symptoms – sputum test results)				Total	
	Positive		Negative			
	No	%	No	%	No	%
Yes	2	0,50%	17	4,24%	19	4,74%
No	7	1,75%	375	93,52%	382	95,26%
Total	9	2,24%	392	97,76%	401	100%

X = 6.235 p. value = 0.013

Study showed there a significant relationship between the history with Asthma and the prevalence rate of TB, Chi-square was 6.235, and the p. value was 0.013.

4.2. Checklist Results:

Visit has taken place to the Alsalam IDPs camp clinic in center 8, where the TB center located the center operated by INGO Care International, met with the three staff, namely Medical Doctor who is the Health Facility in charge sometimes involves in TB treatment, Medical Assistant who responsible for TB center and the nurse dial with statistics for TB, the meeting was on 09 November 2020, they interviewed during the first round of the study, for some information and some data collected through the observation, below are main results from the checklist:

- All staff confirmed that there a TBMU at the clinic, supported by the ministry of health, the support include secondment of staff, staff training in TB, lab reagents, registration stationary, and treatment supplies, while all 3 staff agreed that the support from the ministry is not enough,
- All three staff confirmed there a support from the Global Fund to the program, but only one staff knows that the support is anti-tuberculosis, medical equipment's, and lab supply, with enough quantities.
- Staff wok for TB program at Alsalam PHCC are Medical Doctor who is the Health Facility in charge sometimes involves in TB treatment, Medical Assistant who responsible for TB centre and the nurse dial with statistics for TB, all staff are trained except the lab specialist has just nominated not arrived yet to the canter during the first visit and she need training on TB, TBMU suffer from the instability of lab technicians.
- There is one room specified for TB; used for TB registration and anti-tuberculosis dispensing, they see it is enough and the lab tests processed in the lab in separate area.
- Water and electricity available at the clinic and there enough furniture for the TBMU,
- The Health Facility in charge confirmed that there a free test available while other two staff said no test available for free in the clinic, when checked there is no lab specialist at the clinic that why the test is not processing, the

three of them also confirmed that treatment available for free, the available test is sputum test.

- All confirmed that there are no health education activities at the camp about TB,
- There is a statistics record / register at the TBMU cupboard, records reviewed were patient register, contact tracing, quarterly report, and the patient cart, during the visit no case was under the treatment at the center, and old records were reviewed, they well organized and forms correctly filled with the required information.
- In the record found that in 2018 there were 21 cases registered in the 3 quarters Q1 to Q4, they were 9 patients in Q1, 2 patients in Q2, 3 patients in each of Q3 and Q4, in 2019 record it found that there 3 cases in Q1 and 2 cases in Q2 and the last 1 case registered in the TBMU was in Q3 July 2019, then lost the follow up due to the encountered challenges.
- Challenges identified are shortage of the treatment, Global Fund no longer pay the incentive, no diagnosis and lab technician need training, health education needs in the camp to raise awareness about TB.

After one year of the first checklist, it repeated and confirmed the information with staff in addition to the three staff met during the last study. In the second part of the study met the Lab technician, there are positive points observed as the recommendations followed the finding of the first part of the study as well as implementation have taken place, the improvement appeared in the following points:

- General look of the compound is clean, TBMU has separate rooms for the treatment and lab.
- TBMU is functioning with full staff and staff confirmed that they had training in the new treatment protocol conducted by the TB department.

- Separate Lab technician hired and in place performing TB diagnosis, the researcher benefited from his service in all suspected cases tested in the TBMU.
- Tuberculosis supplies are available, anti TB, lab supplies and stationery. In addition to TB educational Materials IEC. Interviewed staff confirmed that the supply from SMoH is acceptable.
- Tuberculosis Health education and awareness raising activities implemented besides the general awareness session at the PHCC.
- Record and statistics checked there is no registered case currently under treatment, records correctly filled and well kept.

4.3. Results from the Key Informant Interview:

A key informant interview held with the State TB program Coordinator at the TB office in Nyala on November 05, 2020. Therefore, actions from the Recommendations followed up and some implementation has taken place before the second part of the study. Below are findings from the meeting:

Regarding the general background of the program at the state level, the TB program was established in 1999 it was part of the malaria program separated in 2008. Program targeting to detect 4424 cases from the community this year 2020, currently detected only 774 cases represent 23% of the annual target, program planned to establish 50 TB centers (TBMUs / DOTS) in the state by December 2020.

Prevalence at state: Prevalence cannot be calculated as part of information missed or not be accessible from the records although there were 774 new detected cases before the end of the year 2020, the total TB incidence calculated as 14 per 100 000 population, November 2020**.**

The support to the **TBMUs at the state generally and IDPs camp specifically,** there is no any support from the local government, in the other hand there is a partnership with international organizations, the ministry of health provides health cadres, training, there an existing infrastructure, supplies including drugs, lab supplies, equipment's, TB registration stationery, in addition to the joint quarterly supervision and technical support to the organizations when they requested like training to conduct health education, surveys, and other preventive activities at the camps, while the organizations support in running the facilities TBMUs, the incentive for the staff, transportation, preventive activities at the community level particularly IDPs camp. There is a TBMU in Alsalam camp, staff have trained the unit operated by Care International it is not stable in providing services, the big problem is the lab specialist changed many times, and the issue of incentive, particularly from the global fund through SMoH, which stopped since 2017, the organization pays general incentive which is not specifically for TB staff. During

the second part of the study the TBMU is functioning with full trained staff including the separate lab technician CIS is paying the incentive for TBMU staff. State Tuberculosis Program targets to have 50 TBMUs / DOTS in South Darfur currently (up to 2021) there are 26 TBMUs / DOTS at the state level, TBMU is structured to have 2 – 3 staff sometimes DOTS unit even operated by one staff, depend on the availability of staff, these staffs include clinician for treatment, statistician / register and lab technician, sometime the clinician can handle even the register part, for DOTS unit there is no lab so there only clinician and register handle the role. There is a TBMU in Alsalam camp; located in Alsalam Sector 8 PHCC, the TBMU in Alsalam camp currently not functioning as there is no trained lab specialist. During the second round of the study the TBMU is functioning, Lab Technician has been recruited and trained, and SMoH supplied the facility with all needs of TB supply.

Regarding the support from the Ministry of health and the global fund for the TB program; there a support from the global fund, which is not enough as well as this support reduced in 2016, and the current support from the global fund (2020) includes, medical supplies, treatment and laboratories equipment's, as well as training, annual meetings, annual monitoring and supervision, no support from the government of Sudan at all. At the state level there support from WHO for the emergency supervision visits, some INGOs support the supervision visits, and there are also local NGOs support health education at the state level, commenting that generally, the support is not enough at all.

Discussed with coordinator how many staff on TB at the State - staff – numbers; the staff who supported TB program, and the trained staff in TB, there a total of 79 staff at the state supporting TB program from them; there a 6 Staff at the state office those are TB Program Coordinator, two staff for Laboratory one for quality control officer, and other for GeneXpert, there one M&E Coordinator, one statistics Coordinator and the cleaner, other staff represent 73 are based in TBMUs or DOTS; 23 statistician or registers, 24 lab technician and 26 clinicians. All staff were trained in TB except the new staff like Alsalam

Lab technician. In the second interview Alsalam TBMU has its all full staff in place in November 2021.

Information collected about the Infrastructure of TBMUs and health centers, there specific characteristics of the building needed for TB treatment programs particularly laboratory and areas where there contact with TB patients, or treatment rooms where patients come to take their treatment or for follow up, the important aliments are the ventilation, need to cooperate with the patient through window gate and when there direct contact with the patient; the patient should be against the weather direction, and when preparing the spacemen and testing fan should be switched off, water should be available at the lab, so; currently, there is 26 functioning TBMUs / TB center at the state level. The lab should be separated from other rooms, registration or treatment but due to poor infrastructure in many areas programs use one room for all in some areas, so; the gap in some areas as mentioned above programs planned to functioning 50 TBMUs at the state while the current number of functioning TBMUs are 26, so the gap is 24 TB center. Alsalam center is functioning the current gap is Lab technician; needs to be trained. The test is available for free in Alsalam camp, program can support the research and the treatment available for free. Although later during the research, it confirmed that no test available, and no services even, there is no treatment at the TBMU.

TB coordinator asked about the TB strategy in terms of the application of communication and advocacy for TB (health education) and advice for implementation, like IEC materials and the kind of activities currently implemented by the program and its partners; the result that the program currently provides free diagnosis and treatment of TB cases, through the provision of trained staff and supplies, and advised for implementation that there are other activities program needs to support for prevention these activities include; health education at the community level, need to raise awareness about tuberculosis's signs, symptoms and prevention, the program needs to conduct regular surveys to see the prevalence and the factors related to the prevalence, Community Health

Volunteers need to be trained and oriented to send tuberculosis messages beside other disease control and prevention messages to the community. Part of the study implementation is to train community volunteers in TB awareness, which is done for 32 participants for one day, the activity appeared to have a good outcome in awareness raising although there is still a gap in some information related to community knowledge.

There are a few records and documents reviewed, including; new protocol verbally, quarterly reports, program plan, and new IEC materials.

TB Coordinator asked about program challenges and suggestions for solutions, below are the main challenges mentioned:

1- There is no local or government financial support,
2- No incentive to staff this resulted in the interruption of the service, CIS committed to the TBMU, increased the incentive for staff and add additional staff to TBMU.
3- Staff stigma,
4- No attractive environment
5- The program has no means for transportation; this resulted in inaccessibility to reach some areas to support the monitoring and supervision of TB activities,
6- Lack of cooperation from some INGOs and they consider tuberculosis is supported by the global fund, they do not support it following to some donor restrictions and regulations,
7- Poor office infrastructure no separate office for TB at the state SMoH office
8- TB is a communicable disease it is risky compared to other diseases, so the salary and the incentive are not enough,

Above challenges disrupt the program in some areas, instability of staff particularly trained staff, inaccessibility to reach some areas, failed to achieve the annual target in 2020 as well as 2021.

There is no information to confirm whether these challenges affected TB prevalence directly or indirectly, as there is no survey, study, or comparison done to confirm this. There are some recommendations from the TB Coordinator can be done **to overcome the challenges, they include the following:**

1- Activate health education activities in all IDPs camps,
2- Early detection of cases and treatment are important aliments to disrupt disease transmission,
3- Federal and state support to the TB control program particularly incentives to staff
4- Strengthening referral system through community health volunteers and community structure; early detection of cases and refer for test
5- Separate office with the complete department for TB includes supply chain management,
6- Continues training and support to the program supervision locally and international support
7- Support and increase the health education and community surveys.

The key informant interview had been repeated after a year with the State TB program Coordinator at the TB office in Nyala in November 2021. Most findings from the first meeting remained while there an improvement of recommend points related to Alsalam IDPs camp. Points for improvement include the following: The functioning of TBMU, the recruitment of Lab Technician, training to staff on the new treatment protocol, community engagement in health education about TB and the positive collaboration between INGOs and the TB program in Alsalam.

Chapter Five:

5.1. Discussion,

5.2. Conclusion,

5.3. Recommendations,

5.4. References, and

5.5. Appendices

5.1. Discussion:

The first part of the study illustrated that the prevalence rate of tuberculosis (suspected case) is 4.2% (17) and the prevalence rate of the smear positive case is 2.2% (9) among the study population, the prevalence rate is high compared to what stated by (13) that "the republic of Sudan has a high burden of tuberculosis (TB) with a prevalence of 209 cases per 100,000 of the population and 50,000 incident cases during 2009 (13)". While the result agrees with (19) "The study resulted that TB is spread all over Sudan". The percentage of positive cases among the total suspected cases is 53%, active case findings discover more cases; compared to what was found during the Key Informant Interview with the TB Coordinator "the program targeting to detect 4424 cases from the community this year 2020, currently Nov 2020 detected only 774 cases represent 23% from the annual target" The 774 new detected cases before the end of the year 2020 gives the total TB incidence 14 per 100 000 population. It is low incidence compared to the total country incidence in what recently stated by WHO "according to the last available data for country profile (Estimates of TB burden 2018) the total TB incidence is 71 per 100 000 populations this is 30000 cases (6)" the low incidence is due to program failed to achieve annual target 2020 as stated above. The high prevalence among the study also agrees with what was stated by (17) that "95% of individuals with TB live in the poorest countries: because of the poor health coverage of the population, only a proportion of these patients are detected and treated". The second part of the study November 2021 illustrated that the prevalence rate of tuberculosis (suspected case) is 7% (27) appeared to be high than the suspected case in the first part of the study, which was 4%(17). While no positive case detected in the second part of the study compared to a prevalence rate of the smear positive case is 2.2% (9) among the study population in the first part of the study. The reduction in the prevalence rate is due to interventions took place after the first part of the study which agrees with (25) stated that "Health education for behavior change and community outreach in addition to others are

crosscutting components for TB programs contributing to prevention and control".

In the first part of the study, more cases 89% aged between 20 – 49 years old, without statistically significant, this agrees with the statement by (12), "More than 75% of TB-related disease and death occurs among people between the ages of 15 and 54, the most economically active segment of the population".

In the first part of the study, there is a strong relationship between people who has signs and symptoms who were considered suspected TB cases, sent for test confirmation and the prevalence rate of TB (smear positive); the prevalence is high among people who have signs and symptoms 9 (2.24%). This agrees with (5) "The symptoms of TB include general weaknesses, weight loss, fever, and night sweats. In pulmonary tuberculosis, the symptoms include persistent cough, a cough lasting for more than 2-3 weeks".

The study revealed that interventions have positive outcome to reduce the prevalence rate of TB in the second part of the study; factors positively reduced the prevalence in the second part of the study. The high prevalence of TB in the first part of the study has many related factors, including knowledge, attitudes, and practices of people in addition to other socioeconomic factors. In the first part of the study there were few percentages agree with the scientific and basic facts of TB; mode of transmission, prevention, and control, and findings show less knowledge compared to the scientific facts about TB transmission mentioned in (17) and (20) "Cases of pulmonary tuberculosis are highly contagious when they are smear-positive and represent potent sources of infection, thus completing the cycle of transmission, TB can affect any organ in the body. Pulmonary TB is the most frequent site of involvement; extra-pulmonary TB is less frequent. Only pulmonary TB is infectious, the causal agent is *Mycobacterium tuberculosis* (the tubercle bacillus) (17)" and (20) mentioned that "During coughing, speaking, or sneezing, the patient produces tiny infectious droplets from the bronchial tree; an aerosol of droplets each of which contains several bacilli, these droplets dry out and remain in the air for several hours (20)". The gap of the knowledge also

appears in other basic knowledge about TB; include the cause of TB, receiving of health education message related to TB, the time of receiving message, and type of preventive activities, there statistically significant in this study shows that there a relation between people received health education message, and the prevalence among those did not receive health education message 5 (1.25%). This agree with (25) “Health education for behavior change and community outreach in addition to others are crosscutting components for TB programs are contributing to prevention and control”.

However, in the second part of the study the knowledge, attitudes and practices of people slightly increased due to health education intervention in the community which covered many topics, the increase appeared in the percentage of people heard about TB before, name of the disease, knowing that TB is an infectious disease, the treatment and the possibility of curing, it shows positive knowledge gained after intervention, the findings agree with (14) “In most cases, TB is treatable and curable; however, persons with TB may die if have not got proper treatment”.

Another improvement appeared in some attitudes and practices among the study population like when a person has cough with blood what they do; like people seek for modern medicine, to consult health cadre, visit a doctor, or practicing self-treatment and use traditional medicine, or consult someone (herbalist) to use tradition medicine or relay on self-treatment use of modern medicine. Their knowledge about the available services in the camp like a TBMU at the camp, availability of free of charge diagnosis and treatment of TB in Alsalam camp. Above findings were confirmed from the checklist, staff confirmed that there is no test available in the clinic, no lab specialist employed at the clinic during the first part of the study, while they confirmed that the treatment is available for free, and there are no TB health education activities at the camp. At the same time this correspond with findings from the community in the first study that 77% (310) said they don’t know who provides prevention activities in Alsalam, while 17% (68) said there an INGO who provide TB prevention activities, and 6% (24) see

the State Ministry of health provides TB prevention activities at the camp whilst there 3% (13) mentioned there another agent provide this services, only 2% (5) see that a LNGO working in the camp provide preventive activities with community volunteers, there an increase by 2.3% in the second part of the study on the knowledge of IDPs that there is a TBMU at the camp. This agrees with (60) "To reduce the burden of TB, a coordinated approach is required. This approach combines the implementation of an internationally approved TB control strategy with health promotion, disease prevention, case detection, and patient treatment beginning at the first patient encounter, furthermore primary health care providers can play an important role in TB control through early detection of the disease, referral for treatment, and involvement in directly observed treatment (60).

In the 1st part of the study population showed low percentages in their knowledge, attitudes and practices regarding TB transmission, infection and measures individuals can apply in addition to stigma consideration, 43.9% (176) confirmed they do not mind can visit or will visit a TB patient if any, while 29.7% of respondents said they never heart about any TB patient, and 26.4% (106) answered never visit a TB patient. In terms of greetings, cooperation, and reactions to TB patients, 34.4% of people do greeting TB patient normally, while 26.7% (107) said they greet TB patients from distance and there a 21.9% (88) of respondents change the way of greeting / and be more careful. On the other hand, 4% (16) of people normally shake hands to hands to greet TB patients and there were 13% of respondents mentioned there is another way to greet TB patients like a phone call or avoiding visits to the patient. This result shows a lack of knowledge, wrong practices and negative attitudes regarding TB patients among the study population, as stated by (5), (17) and (20), "during coughing, speaking, or sneezing, the patient produces tiny infectious droplets from the bronchial tree; an aerosol of droplets each of which contains a number of bacilli, these droplets dry out and remain in the air for several hours (20)" "The infectiousness of a patient is linked to the quantity of bacilli contained in his/her sputa. Patients with

sputum smear-positive (M+) are by far the most contagious. Those with only (C+) are less contagious while patients whose sputum (M-, C-) are usually not contagious. Patients suffering from primo-infection are not contagious. Extra-pulmonary (EP) forms of the disease are only contagious in exceptional circumstances. Children are generally not contagious due to weaker cough mechanics and less sputum production (20)". Compared to the second part of the study, positive changes in behavior has appeared in the community regarding the contact with TB patients. There is a 3.5% positive significant deference between the two parts of the study to reduce the visit to TB patients. Furthermore, there is a positive cooping to decrease contact with TB patient; percentage of normal greetings TB patients decreased, and there more than 20% increase in people to greet TB patients from distance in the second part of the study after intervention, there a 7% difference in improving the way of contact with patient to avoid TB transmission. There also a 15% increase positively of people changing the way of cooperation with patient to avoid transmission, which agree with (49). While the negative thing observed is the increase in social isolation and patient separation this may lead to stigma. These results agreed with (49) "TB related stigma associated with educational status, poverty, and lack of awareness about TB. Stigma matters in TB prevention, care, and treatment and warrants stigma reduction interventions".

In the first part of the study showed most people 54.86% (220) know the signs and symptoms of TB are coughing for a long time this agree with mentioned by (5) "The symptoms of TB including general weaknesses, weight loss, fever, and night sweats. In the pulmonary TB, the symptoms such as persistent cough, a cough lasting for more than 2-3 weeks, Chest Pain, Chills, Discolored or bloody sputum, fatigue, loss of appetite, pain with breathing, severe headache, shortness of breath, slight fever, tiredness or weakness, weight loss". Compared to the second part of the study there 11% increase in the knowledge of IDPs who see TB sign and symptoms is coughing for long time, and 3% knowledge increase of sign and symptoms is coughing up blood.

From the first part of the study the reason behind the change the way of greetings; 72.3% of participant mentioned that they changed the way of greetings to the TB patient to avoid TB transmission, this agreed with (20) “The greatest factors contributing to transmission are the closeness of contact with the infectious source, the duration of exposure, and the bacteriological status of the source” while 27.7% were have another reasons they believe of Allah no infection and can greet normally, some others said that TB is not an infectious disease, and others see have social believes they must greet TB patient normally there is also some people say that do not know the way of TB transmission or they do not know about the disease itself. The findings indicate lack of general knowledge which agree with the findings from the KII “the lack of general knowledge of TB in the camp”. In addition to lack of knowledge there might be other factors behind the behavior they are following, which agreed with (32) “Both gender, young age and low level of education are high stigmatizing towards TB patients. Misconception was observed in the causes, symptoms and prevention methods of the disease”.

For the interaction with the TB patients out of 401 sample size 44.9% (180) of people believe that disease transmit to them so they have to change the cooperation, 23% (93) change this to avoid infection from patient, which agree with (5) “A person with the disease can infect others for several weeks after he or she begins treatment” and with (20) “The greatest factors contributing to transmission are the closeness of contact with the infectious source, the duration of exposure, and the bacteriological status of the source”.

In the first part of the study 83.8% (336) population answered they can normally inform others like coworkers or friends when they infected with TB, this disagreed with what was stated by (32) and indicate low rate of stigmatization in Alsalam camp regarding TB. While there is 31% of study population believed that others like coworkers and friends do not visit them when they infected with TB, this agreed with (32), “Stigmatizing attitude was cleared explained among the participants are 63% and 29.3% are moderate and high stigma respectively, there were 69.7% were avoided the TB patients and (64.3%) were dislike to continue

the social relationship. The participants were unwilling to: use the patients' utensils (82.3%), share drinking and food (69.0%), share same place of work (61.0%), even the patients on TB treatment. 63% mentioned that they were not allow their daughters / sons to marry from a person who cured from TB".

In the second part of the study there is positive difference observed by 5% in the perception of a study group that friends and coworkers can visit them or the patients if they infected with TB, this agreed with (49) in a study that "a third of the population have high scores for TB-related stigma, which were associated with educational status, poverty, and lack of awareness about TB. Stigma matters in TB prevention, care, and treatment and warrants stigma reduction interventions".

In the first part of the study, there were 85% of study people believe that there is no relationship between TB and any other disease, which somehow does not agree with (1) "While the human immunodeficiency virus (HIV) infection has clearly had a profound effect on TB epidemiology, other potentially important risk factors have been somewhat neglected. In the coming years, more attention is needed to be given to the interaction between chronic diseases and TB, including diabetes, under nutrition, and respiratory illnesses caused by tobacco and air pollution". While in the second part of the study the knowledge of people increased by 2% were seeing that there a relationship between TB and other diseases. Although the first part of the study found some prevalence of mentioned disease while no statistical significance for a relationship.

The study showed a strong relationship between the number of people sleeping in a room, 3 persons sleeping in one room recorded high prevalence of 3 (0,75%), which agrees with (17) "When people live or sleep near a patient, they are at risk of inhaling TB infectious particles. And agrees with (11) "Refugee and displaced populations are known to be as the increased risk for TB. This finding is believed to be caused, in part, by increased risks for malnutrition and overcrowding, which lead to increased susceptibility to and transmission of TB" also this agreed with

(7) “TB is a particularly important disease in the long-term emergencies where refugees or IDPs are in camps or overcrowded communities for long periods”.
Previous studies considered some risk factors influence TB prevalence although these have not been confirmed in this study or there is no significant relationship, these factors include age group, marital status, gender, education level, occupation, family monthly income, and Family HH head. On the other hand there were strong relationships appeared positive or negative influence the prevalence rate among the study population these factors like knowing someone who has been infected with TB, previous infection of TB, knowledge of how does TB spread, knowledge of TB treatment outcome “recovery” after treatment, knowing that TB test is available for free, presence of TB patient in the visited HHs during the 6 months, presence of other HH members who have signs and symptoms of TB during the visit, most of them had already been discussed above. An important socioeconomic factor related to TB from previous studies is the HH income, it is part the study limitation, researcher could not be able to measure its impact on TB prevalence, due to prices increases and the instability in the exchange rate, it difficult to calculate the monthly income ranges that set earlier accordingly the result has been excluded.

5.2. Conclusion:

- The study for the epidemiology of tuberculosis in Alsalam IDPs camp conducted successfully; prevalence rates measured, associated risk factors and TB interventions assessed in the period between 2019 and 2021.
- In the first part of the study the prevalence rate of TB in Alsalam camp found to be 2.2%, Interventions were recommended, implemented, and the second part of the study was conducted, no case was detected during the second part of the study.
- After the TB program interventions, it had been confirmed that there were many factors contributed to the high prevalence of TB; low levels of education, overcrowding, and lack of awareness are the factors associated with the spread of tuberculosis, in which there were statistically significant factors related to TB prevalence namely receiving a Health Education Messages, the number of people sleeping in a room, and contacting or knowing someone who has infected with TB.

5.3. Recommendations:

The study aimed to study the epidemiology of TB in Alsalam IDPS, with its specific objectives; to measure the prevalence rate, to look of associated risk factors to the prevalence and the effectiveness of TB program interventions to the prevalence rate. Below are recommendations from the study:

- The prevalence rate of tuberculosis is higher in the South Darfur particularly among Alsalam IDPs during the first part of the study, TB Department SMoH SD to intensify early case detection and activate referral pathways from community to TBMUs in the camp to ensure proper treatment, also need to activate TB centers and community outreach activities, particularly the contact tracing techniques by leveraging partnerships and existing systems to reach contacts exposed in homes.
- There is a lack of awareness among the community in term of knowledge, negative behaviours; attitudes and practices, there is a gap of knowledge regarding TB services available in the camp. SMoH TB program and the NGOs who are operating in Alsalam to involve community through health committee in TB activities especially in awareness raising, conduct campaigns, integrate TB awareness session with other community health activities, include TB awareness session with other health education messages.
- The TBMU exists in the camp, while there a repeated disruption over the years, due to lack of basic things; during the disruption patients were taking the services from Nyala. The study interventions addressed that there was a positive outcome though sustainability is required. TB Program in South Darfur with INGOs who are operating in Alsalam need to commit to avoid TB services disruptions in the future.
- From the KII there are managerial, logistical, and financial challenges, at the state level, no more information to confirm these challenges are affecting the TB prevalence directly or indirectly, as there is no previous survey has done to confirm this or any study or comparison. Minstry of

health to encourage and allow more evaluation studies to be done to have more insight to TB in the state and look for other related factors.

- Study designed as pre and post interventions; there a challenge related to the time of interventions and the survey, for future researchers need to consider timeframe, IDPs movement, their activities and seasonality.

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5.5. Appendixes:

1- Questionnaire:

Shendi University

PhD program - Public Health (Epidemiology)

Questionnaire to study the epidemiology of tuberculosis among internally displaced persons at Alsalam camp 2019 -2021.

Part 0: consent and permission:

1- **Consent note this need to be read for every interviewee:** This is a study to know the status of TB in the camp, information will be treated confidentially, no names written unless needed for test results with permission from you, test will be processed for the suspected TB persons, test result will not be shared with any person only will cooperate for treatment, you are free to participate or not to this interview, to answer any question or not. Clear? (1) Yes (2) No

2- **Are you interested to participate in this study?** (1) Yes (2) No

Part 1: Demographic profile:

1- Gender: (1) M (2) F

2- How old are you? (Circle one)
(1) 10 -19 (2) 20-29 (3) 30-39 (4) 40-49 (5) 50-59 (6) 60 and above

3- Marital status: (circle one) (1) Never Married (2) Married (3) Divorced (4) Widowed

4- Educational background: (circle one)
(1) None (2) Khalwa (3) Primary/ basic (4) Secondary (5) College University and above (6) other specify

5- Occupation: (1) Labor daily (2) Free work – labor (3) employed (4) unemployed (5) student

6- Income: family monthly income: (1) Less than 1000 SDG (2) from 1000 - 1499 SDG (3) from 1500 to 1999 SDG (4) from 2000 to 2499 (5) from 2500 to 2999 SDG (6) more than 3000

7- Original place (distance): (1) Less than 10 km (2) more than 10 km (3) outside south Darfur state ____

8- Family size: ____

9- Type of rooms: (1) local construction / building Gotia, Kornock (2) rooms build / constructed from muds or burned brick and cement (3) other specify:

10- How many people sleeping in a room? ____

11- Family HH head: (1) Father (2) Mother (3) Son (4) Daughter (5) Other external relative

Part 2: Knowledge attitude, practice (behaviour) and other factors:

1. Have you heard of TB (give all local names)? (1) Yes (2) No

2. What is it (consider all local names)? (1) A terrible headache with dizziness (2) A harmless cough (3) A passing diarrhoea (4) A dangerous lung disease (5) dermatitis (6) I don't know

3. What do you call it (locally)? (1) TB, (2) Daran (3) Sadria (4) Sull (5) other specify name _____

4. What are the signs of TB (check all)? (1) Coughing (2) difficulty breathing (3) Tiredness, (4) fever (5) Coughing of blood, (6) weight loss (7) / Diarrhoea, (8) I don't know

5. Have you ever been infected with TB? (1) Yes (2) No

6. If you answered "yes" to question 5, how long ago were you infected? ___

7. Do you know someone who has been infected with TB? (1) Yes (2) No

8. Do you know what TB (tuberculosis) is? (1) Yes (2) No

9. How does it spread? (1) Cough (Air) (2) Unclean food or water (3) contact in Public area (4) Hereditary (5) Sexual contact with TB patient (6) Don't know (7) Other mode specify _____

10. What causes TB? (1) Bacteria (2) Virus (3) Evil eye (4) Satan or witchcraft (5) Don't know /(6) Other cause _____

11. Is it infectious? (1) Yes (2) No (3) Don't know

12. Is it preventable? (1) Yes (2) No (3) Don't know

13. If you answered yes in question 12 how can be prevented? (1) Good ventilation (2) boiling of milk (3) cooking food (4) By eating well (5) By having a strong health (6) By vaccination (7) I don't know (8) Other specify _____

14. Is it treatable? (1) Yes (2) No (3) Don't know

15. How long does the TB treatment take? (1) Less than one month (2)1 month (3) 2 months (4) 3months (5) 6 months (6) 1 year (7) Depends to the case and type (8) Don't know

16. Is the recovery complete? (1) Yes (2) No (3) Don't know

17. If you had cough with blood, what would you do? (circle ONE of the 4 choices)

(1) Self-treatment: traditional medicine (2) Self-treatment: Modern medicine (3) Consult someone: traditional medicine (4) Consult someone: Modern medicine

18. If you had a persistent cough with no blood, what would you do?

(1) Nothing (2) Ask a family member or a friend (3) Self –treatment (4) Wait for sometime before consulting a health care provider (5) Other _____

19. If you answered 'wait for sometime', in question 18, how long would you wait for?

(1) 1 week (2) 2 weeks (3) 1 month (4) 2 months (5) 3 months (6) more than 3 months

20. Do you know that there is TBMU in the camp? (1) Yes (2) No

21. Do you know that TB diagnosis / test is available for free? (1) Yes (2) No

22. Do you know that TB treatment is available for free? (1) Yes (2) No

23. Are you visit TB patients if there any? (1) Yes (2) No (3) I never heart about any TB patients

24. How you greeting patients of TB? (1) Normally (2) change the way of greeting / and be more careful, (3) from distance, (4) Shaking hand to hand, (5) huge, (6) other specify _____

25. Why? (1) to avoid transmission (2) other reason: _____

26. How often people (family) react when they know that a family member infected with TB? (1) Normally, (2) change the way to cooperate with, (3) separate him / her, (4) social isolation "socially isolated" (5) other specify_____

27. Has there been a change in family's interaction with TB patients contracted the disease? (1) Yes (2) No

28. Why do you think family's interaction with TB patient changed? (1) Disease transmits to them, (2) to avoid infection from patient, (3) they do not know the mode of TB transmission, (4) other reason specify_____

29. If you infected with TB would you inform your co-workers about your disease? (1) Yes (2) No

30. Do you believe your co-workers/friends visit you? (1) Yes (2) No

31. Is there a relationship between TB and other disease? (1) Yes (2) No

32. Do you received any health education messages related to TB?(1)Yes (2) No

33. If answer in 32 yes. When? (1) Less than one month (2) more than month (3) 2 months ago (4) three month ago or more

34. Are there any TB prevention activities running here in the camp? (1) Yes (2) No (3) I do not know

35. If yes. What are they? (1) Health Education (2) Active case findings and referral (3) Psychosocial support (4) Others TB/HIV activities, others integrated with other services

36. Who provides / supports the activities? (1) SMoH,(2) INGO, (3) LNGO (4) community volunteers (4) Other specify _____ (5) Don't know

Part 3: Prevalence TB status:

1- Do you have TB and currently following the treatment? (1) Yes (2) No
2- TB status (ask if there are symptoms **three or more of** The symptoms of TB include; general weaknesses, weight loss, fever, night sweats. In the pulmonary tuberculosis, the symptoms include persistent cough, a cough lasting for more than 2-3 weeks, Chest Pain, Chills, Discolored or bloody

sputum, fatigue, loss of appetite, pain with breathing, severe headache, shortness of breath, slight fever, tiredness or weakness, – if Yes suspected send for sputum test): Symptoms are (select all): (1) general weaknesses, (2) weight loss, (3) fever, / slight fever (4) night sweats. (5) persistent cough, a cough lasting for more than 2-3 weeks, (6) Chest Pain, (7) Chills, (8) Discolored or bloody sputum, (9) fatigue / tiredness, (10) loss of appetite, (11) pain with breathing, (12) severe headache, (13) shortness of breath,

3- TB status, from the above signs and symptoms, if suspected case, send for test, information for follow up the result needed at least tell no:
4- TB status (if there are symptoms – sputum test results): (1)+ ve (2) - ve
5- TB status Is there any TB patient at the household now or within last eight months (1) Yes (2) No
6- If yes, how many people?
7- TB status (ask if there are symptoms with any HH member? (1)Yes(2)No
8- TB status (if yes there are symptoms, other HH members), suspected case, send for test, information for follow up the result at least tell:
9- TB status, sputum test results for other HH member: (1) + ve (2) – ve

Other factors, more info will be collected from patients with TB symptoms and who send for TB test as well as this info will be taken for all TB registered patients from Alsalam Camp for triangulation telephone number or contact needed for follow up the result of the test: T number _____

10- Who is the interviewee: (1) Same person who have sign and symptoms (2) another HH member (3) registered patient from TBMU
11- History with diabetes:(1) Yes (2) No
12- History with Hypertension: (1) Yes (2) No
13- History with Asthma: (1) Yes (2) No
14- History with TB if infected before (1) Yes (2) No
15- History with TB if infected before what was the treatment outcome (1) cured, (2) relapse (3) defaulter (4) MDR (5) currently in treatment
16- HIV / AIDS status: (1) Yes (2) No
17- Age: _____
18- Gender: (1) M (2) F
19- History with Malnutrition specify, micro nutrient deficiency, underweight, anaemia etc (1) Yes (2) No
20- Smoking. (1) Yes (2) No
21- History with COVID-19
22- Occupation: _____

2- Checklist:

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PhD program - Public Health (Epidemiology)

TBMU: (at the camp with medical officer or medical assistant responsible of the TBMU)

- TBMU Presents or not *(1) Yes (2) No*
- Is there any support from Ministry of health *(1) Yes (2) No*
- If yes, what is it?
- If yes is it enough?
- Is there any support from the global fund *(1) Yes (2) No*
- If yes, what is it?
- If yes is it enough?
- Staff wok for TB program at the PHCC positions and functions: _____.
- Are there staff trained in TB? *(1) Yes (2) No,*
- Number of staff trained in TB_____,
- Are staff work for TBMU enough? *(1) Yes (2) No*,
- Infrastructure of TBMU and health center, present, units, rooms, etc___.
- Are the area, rooms, etc enough *(1) Yes (2) No,*
- *Are there a* separate, rooms, space for TBMU*? (1) Yes (2)* No
- Separate place for lab / TB test? *(1) Yes (2) No*
- Water and electric available? *(1) Yes (2)* No
- Furniture available for program / TBMU? *(1) Yes (2) No*
- Test availability present *(1) Yes (2) No*,
- If yes is it free?
- Type of test available? _____,
- Availability of the diagnostic and treatment free of charge or the cost present *(1) Yes (2) No*,
- If no and there any cost how many SDGs for the services?
- Health education about TB, present *(1) Yes (2) No*,

- Are the awareness and messages regarding TB enough *(1) Yes (2) No*
- **Review:** Record of current TB cases will be reviewed and data used to support the study as in the questionnaire patient will be interviewed.
- Are there a records at TBMU? *Yes (2) No*,
- If yes, what are they? List all records available
- Are they well organized and forms correctly filled with required information? *Yes (2) No*
- How many TB case currently under treatment? _____.
- Challenges, are there challenges? *Yes (2) No*
- If yes, what are the challenges related to TB program implementation at health facility level.
- Are there other challenges observation? *Yes (2) No*
- What are they? List challenges: _____
- Others, if any observation or information will be specified. _____.

3- Interview:

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Key Informant Interview: (at the state level interview with TB coordinator in Nyala)

- General background about the program at the state level, check records if available?
- Prevalence at state? _____
- Support to TBMUs at the state generally and IDPs camp specifically - Alsalam IDPs camp, what is the support?
- How many TBMUs at the state level? Is there a TBMU in Alsalam camp and function? *(1) Yes (2)* No, what is it? *Name* _____
- The support from Ministry of health and global fund to the TB program, is there a support what is it? Its kind? Is it enough?
- How many staff on TB at the State - staff – numbers? staff supported TB program
- Number of staff trained in TB?
- Staff positions and functions? (notes about staff at the state level: _____.
- Infrastructure of TBMUs and health centers?
- Number of functioned TBMUs or center? At the state level
- TB unit components rooms, equipment's etc?
- Number of TBMUs with full infrastructure and the gap generally? at the state level: _
- Number of TBMUs with full infrastructure and the gap specifically, in Alsalam? ____
- Test availability, is it free? and kind of tests? How can support the research / study?
- Availability of the diagnostic and treatment free of charge or the cost? ___.

- The application of communication and advocacy for TB (health education) and advices for implementation, IEC materials? kind of activities currently implemented by program*:* _____
- Records and statistics for review? What are they? What are the info collected from the records? This will be determined. _____.
- Challenges, what are the challenges? How further they affect the program at the state? Are they affected TB prevalence? What are the recommendations to overcome the challenges? _____.
- Others: (any comments)

4- Interventions:

Following to the study design, first survey findings and the study recomendation below are program for intervention, need to be implemented before the second round of the study, expected results from the intervention are:

- Advocate and lobby to have TB centre with trained staff
- Reactivate Alsalam **PHCC** TBMU by the following:

- Researcher in close communication with TB program, CIS and field staff at Alsalam PHCC, link them discuss the challenges, the way forward and follow the actions to reactivate the center
- Trained staff Lab specialist, clinicians on the updated protocol
- Provide anti TB drugs and Lab supplies
- Include TB education through health education sessions at the centre like other diseases, this include other PHCC
- Researcher work with other PHCCs at the camp and private clinics to refer suspected TB cases to the center and disseminate messages that the TB center is activated
- Others

- Work at **community** level:

- Train community volunteers, use health education materials from the state ministry of health,
- Include TB awareness messages with WASH messages and other general health education at the camp level
- One- or two-days training sessions to community volunteers on TB topics on (basic knowledge, and updated information about TB, TB at camp, research findings, barriers, referral of suspected TB cases, etc) or following the TB program guidelines for community volunteers
- Mobile health education use megaphone; conduct campaign to raise community awareness to know TB signs, symptoms, TBMU and the free services available; diagnosis and treatment

- **TB coordinator:** Provide essential supply to the clinic; anti TB, lab supply, seconded lab specialist, train staff in new protocol,
- **Organization CIS**: Incentive for staff, receive and transport TB supply to Alsalam camp PHCC, intensify and integrate health education activities in the clinic and WASH sector
- **Researcher:** Over all follow up of interventions, to meet with DG to discuss the support of TB program at the state level with mentioning challenges faced by the TB program; the issues mentioned such as; there is no local or government financial support, no incentive to staff this resulted into the interruption of the service, staff stigma, no attractive environment, the program has no mean for transportation, these resulted in to inaccessibility to reach some areas at the state level, lack of cooperation from some INGOs and they consider tuberculosis is supported by the global fund so they do not support it following to some donor restrictions and regulations, poor office infrastructure no separate office for TB at the state SMoH office, TB is communicable disease it is risky compared to other diseases, so the salary and the incentive is not enough.

5- Supporting document from Shendi University:

بسم الله الرحمن الرحيم

The Republic of the Sudan جمهورية السودان

وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education & Scientific Research

Shendi University جامعة شندي

كلية الدراسات العليا والبحث العلمي

Faculty of Graduate Studies & Scientific Research

التاريخ: 2020/1/20 م النمرة: ج ش/ك د ع/أ/1

الأخ/ .....

الموقر...

السلام عليكم ورحمة الله وبركاته

الموضوع: تسهيل إجراءات دراسة دكتوراه

إشارة للموضوع أعلاه نفيدكم بأن الطالب / عبدالباسط محمد برمة سالم من ضمن الطلاب المسجلين لنيل درجة الدكتوراه في الصحة العامة (الوبائيات).

ونأمل في حسن تعاونكم مع كلية الدراسات العليا والبحث العلمي جامعة شندي، نرجو شاكرين تسهيل مهمته بغرض إجراءات البحث.

وجزاكم الله خيراً ...

د.أمير سليمان مصطفى أبوقرون

مسجل كلية الدراسات العليا والبحث العلمي

السودان- شندي- ص.ب: 142/143 – هاتف: 00249155662167 – فاكس: 00249261872509

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6- Supporting document from Shendi University registration Certificate:

جمهورية السودان
وزارة التعليم العالي والبحث العلمي
جامعة شندي
كلية الدراسات العليا والبحث العلمي

التاريخ :20 / 1 /2020م

إفادة

تفيد كلية الدراسات العليا والبحث العلمي جامعة شندي بأن الطالب / عبدالباسط محمد برمة سالم ضمن الطلاب المسجلين بالكلية لنيل درجة الدكتوراه في الصحة العامة (الوبائيات) .

وحررت هذه الإفادة بناءاً على طلبه ، ، ،

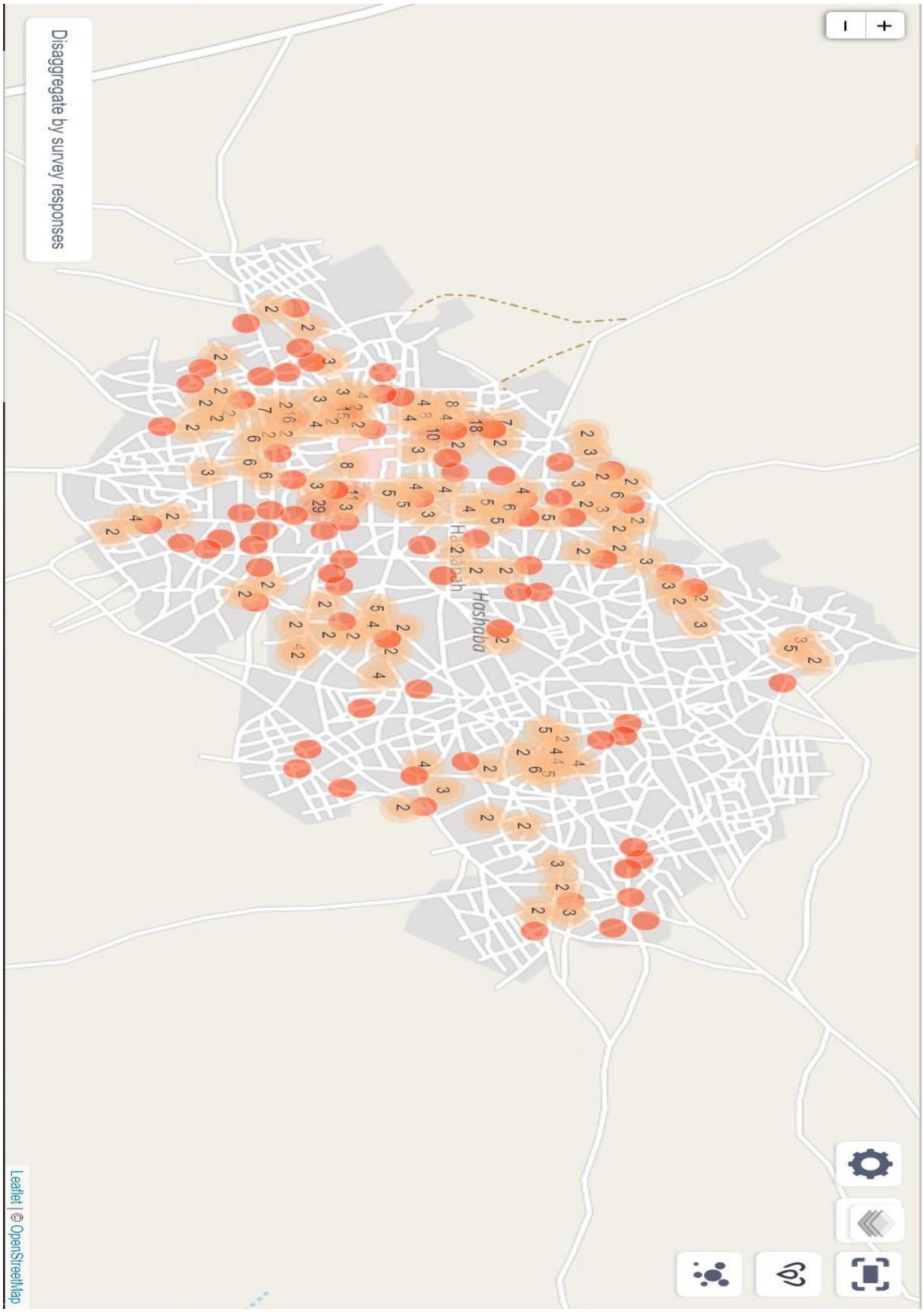
جامعة شندي
مسجل كلية الدراسات العليا والبحث العلمي

د.أمير سليمان مصطفى أبوقرون
مسجل كلية الدراسات العليا والبحث العلمي

السودان- شندي- ص.ب: 142/143 – هاتف: 00249155662167 – فاكس: 00249261872509
Sudan – Shendi – B.O.Box:142-143 Tel: +249155662167 – Fax+249-261872509 – e-mail:fgs@ush.sd

7- Map for Alsalam IDPs camp:

8- Map for visited HHs in Alsalam camp from KoBo program:



KoboToolbox

9- Study permission from the SMoH South Darfur:

جامعة شندي
كلية الدراسات العليا والبحث العلمي
برنامج الدكتوراه – الصحة العامة – (الوبائيات)

التاريخ:

السيد / مدير عام وزارة الصحة - ولاية جنوب دارفور

السلام عليكم ورحمة الله وبركاته

الموضوع / إجراء دراسة بحثية لنيل درجة الدكتوراه في معسكر السلام

بالإشارة إلي الموضوع أعلاه أطلب من سيادتكم السماح والتسهيل في إجراء الدراسة المذكورة في معسكر السلام للنازحين علماً بأن الدراسة بعنوان وبائية مرض الدرن بمعسكر السلام وهي دراسة لنيل درجة الدكتوراة في الصحة العامة (الوبائيات) من جامعة شندي في الفترة من 2019 إلي 2021م.

وشكراً،،

مقدمه:

الطالب عبدالباسط محمد برمة سالم (ضابط صحة)

ماجستير الوبائيات – جامعة الخرطوم

المرفقات:

- خطاب تسهيل إجراء الدراسة من الجامعة
- إفادة تسجيل طالب دكتوراه من الجامعة
- أدوات جمع البيانات
- أي تفاصيل أخرى عن الدراسة عند الطلب

10- Supporting documents permission from Humanitarian Aid Commission to access Alsalam IDPs camp 1:

جامعة شندي
كلية الدراسات العليا والبحث العلمي
برنامج الدكتوراه – الصحة العامة – (الوبائيات)

التاريخ:

السيد / معتمد المعون الإنسان بالولاية .....

السلام عليكم ورحمة الله وبركاته

الموضوع / إجراء دراسة بحثية لنيل درجة الدكتوراه في معسكر السلام

بالإشارة إلي الموضوع أعلاه أطلب من سيادتكم السماح والتسهيل في إجراء الدراسة المذكورة في معسكر السلام للنازحين علماً بأن الدراسة بعنوان وبائية مرض الدرن بمعسكر السلام وهي دراسة لنيل درجة الدكتوراة في الصحة العامة (الوبائيات) من جامعة شندي في الفترة من 2019 إلي 2021م.

وشكراً،،

مقدمه:

الطالب عبدالباسط محمد برمة سالم (ضابط صحة)

ماجستير الوبائيات – جامعة الخرطوم

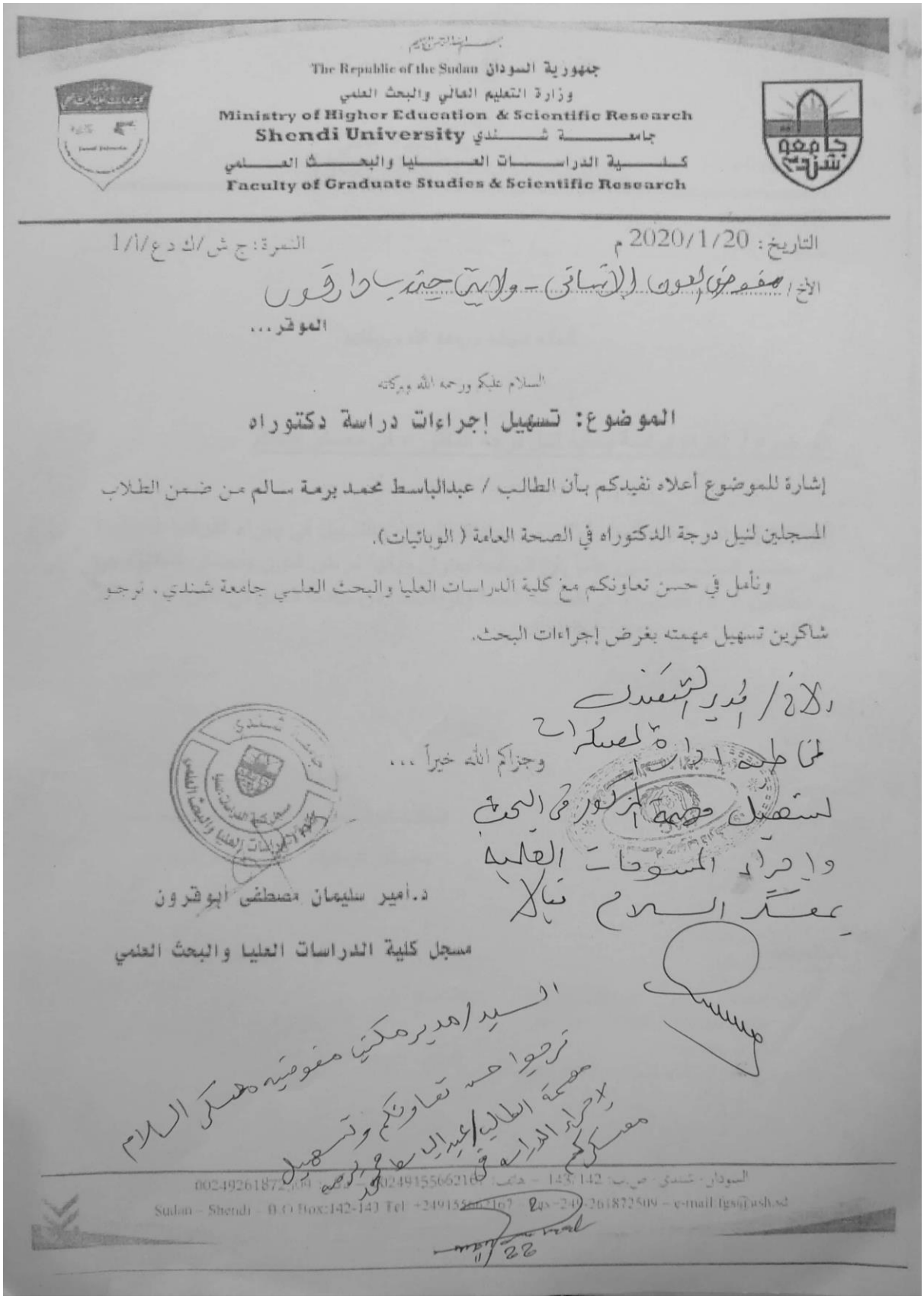
الأخ/ مدير المستشفى
للإجراء المطلوب اتخاذ اللازم
لتسهيل مهمة المذكور أعلاه
والتنسيق مع إدارة المعسكر

المرفقات:

- خطاب تسهيل إجراء الدراسة من الجامعة
- إفادة تسجيل طالب دكتوراه من الجامعة
- أدوات جمع البيانات
- أي تفاصيل أخرى عن الدراسة عند الطلب

السيد/ مدير مكتب المفوضية بمعسكر السلام
ترجوا من كريم تعاونكم وتسهيل مهمة الطالب/ عبدالباسط محمد لإجراء دراسته

11- Supporting documents permission from Humanitarian Aid Commission to access Alsalam IDPs camp 2:



جمهورية السودان The Republic of the Sudan
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education & Scientific Research
جامعة شندي Shendi University
كلية الدراسات العليا والبحث العلمي
Faculty of Graduate Studies & Scientific Research

التاريخ: 2020/1/20 م النمرة: ج ش/ك د ع/أ/1

الأخ/ مفوض العون الإنساني - ولاية جنوب دارفور

الموقر...

السلام عليكم ورحمة الله وبركاته

الموضوع: تسهيل إجراءات دراسة دكتوراه

إشارة للموضوع أعلاه نفيدكم بأن الطالب / عبدالباسط محمد برمة سالم من ضمن الطلاب المسجلين لنيل درجة الدكتوراه في الصحة العامة (الوبائيات).

ونأمل في حسن تعاونكم مع كلية الدراسات العليا والبحث العلمي جامعة شندي، نرجو شاكرين تسهيل مهمته بغرض إجراءات البحث.

وجزاكم الله خيراً...

د.أمير سليمان مصطفى ابوقرون
مسجل كلية الدراسات العليا والبحث العلمي

السيد/ مدير التنفيذي
لمفوضية العون الإنساني
لتسهيل مهمة الباحث في البحث
وإجراء المسوحات العلمية
بمعسكر السلام شمال

السيد/ مدير مكتب مفوضية معسكر السلام
ترجو حسن تعاونكم وتسهيل
مهمة الطالب/ عبد الباسط محمد برمة
لإجراء الدراسة في
معسكركم

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12- List of data collection team who trained on KoBo program and participated in the study:

No	Name	Code for KoBo
1	Abdelbasit M Burma Salim	1
2	Ali Mokhtar Ali Hado	2
3	Nosyba Ali Abed	3
4	Muzamil Adam Ahmed	4
5	Ali Omer Abdu	5
6	Mudathir Hamid	6
7	Hafiz Mohammed Nour	7
8	Safa Amin	8
9	Fatima Ibrahim Abdalla	9
10	Rihab Ibrahima Mahmoud	10
11	Sara Hamdan Fadl alkareem	11
12	Hawa Ahmed Hassan	12
13	Osman Faraheldoor	13
14	Abbass Hassan	14
15	Aida Mohamed Musa	15
16	Yassir Ismail Safielnour	16
17	Elhussainy Adam Abdelrahman	17