Prevalence of diabetes among newly diagnosed pulmonary tuberculosis patients In Khartoum State-Sudan

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Abstract

Tuberculosis (TB) is an infectious disease caused by mycobacterium tuberculosis. It continues to be the leading killer of bacterial diseases worldwide.

Objectives: To estimate the prevalence of diabetes among newly diagnosed pulmonary tuberculosis patients.

It is a prospective, descriptive, cross-sectional, and hospital-based study, in which 78 patients, newly diagnosed with pulmonary TB, were investigated for their diabetes status according to the WHO diagnostic criteria. It was conducted in Alsaab hospital, Abu Anja hospital, and Bahri hospital.

The study revealed pulmonary TB is common among young adult males, 83.3% were male and the mean age was 43.72. Pulmonary TB is common among less educated people with limited income, (25.6% were uneducated,33.3% had a primary school, 20.5% were unemployed, 34.6% were laborers, and 20.5% were employees. In 69.2% of the patients, the diagnosis of pulmonary TB was based on a positive smear for AFB and the remainder on the clinical background. The study showed a high prevalence of diabetes among pulmonary TB patients (29.5%), which is threefold the prevalence in the general, the population in Sudan. 64.1% of the patients have normal BMI and 34.6%were underweight. The study revealed a high prevalence of diabetes among newly diagnosed pulmonary tuberculosis patients.

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Introduction

The association between DM and TB was first described by centuries ago by Avicenna, and co-morbidity was a frequent topic in the medical literature from the first half of the 20th century. (1)
World Health Organization has identified DM as a neglected, important, and a re-emerging risk factor for TB (2) Type 1 diabetes is rarer in African countries than type 2 (3) Chronic non-communicable diseases are a large health problem worldwide. World Health Organization (WHO) data suggest that non-communicable diseases are thought to be the second leading cause of death in Africa. In 2011, the broad category of non-communicable diseases, such as stroke, hypertension, and diabetes mellitus (DM), accounted for one-third of 9.5 million deaths and one-quarter of 675.4 million disability-adjusted life years (4) The prevalence of T2DM and pre-diabetes in north Sudan have increased significantly since 1996 with variations between ethnicities which showed to be an independent risk factor for T2DM. Health authorities are recommended to set plans to meet the health needs of these communities (5)
TB is a major cause of morbidity and mortality in Sudan, the prevalence of all forms of TB in 2009 according to Sudan national tuberculosis Program (NTP) is 209/100,000 (6)
The longstanding civil war in Sudan has resulted in poverty, malnutrition, and a large number of internally displaced populations and refugees, a situation that affected the prevalence and distribution of TB in Sudan.
Diabetes in Sudan is a growing health problem with a major impact and an increasing incidence among all socioeconomic classes. It is associated with high morbidity, mortality, and low quality of life. The annual health statistical report of Sudan (2009) showed the number of outpatient diabetics is 300205 and inpatient 23200 patients

Methodology

Study area

This study was conducted in Al-Shaab hospital which is a central hospital in the capital of Sudan and it is a referral center for all Sudan concerning cardiopulmonary and neurology medicine and surgery, and AbuAnja hospital for chest medicine which in Omdurman, and Bahri Teaching Hospital.

Study population

Seventy eight Patients were newly diagnosed to have pulmonary tuberculosis.

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Inclusion criteria

Adult Sudanese, (Male and female)

Newly diagnosed as pulmonary tuberculosis, according to WHO criteria.

Exclusion criteria

Patients aged less than 20 years.

Patients have a history of tuberculosis.

Patients on immune suppressive drugs

Study design

Prospective, descriptive hospital-based cross-sectional study.

Method of data collection

The following methods were used in the study for data collection;

Standard structured questionnaires were filled in interviews with patients.

Medical records of the patient are used as a source of information about the documented information of the patients.

Values of blood glucose were obtained by using the colorimetric method and these values were used in the diagnosis of diabetes according to the WHO criteria.

***Data management and analysis*:** Data were analyzed using SPSS. Results were tabulated, and presented in percentage forms and charts; where appropriate for easy data presentation.

Ethical Considerations

Institutional approval has been issued from Sudan Medical Specialization Board ethical committee after the revision of the submitted research proposal. Confidentiality was considered throughout the study, and verbal consent was taken from the patients. The respondents were aware of their rights throughout the study. Participation at the beginning and throughout the study was completely voluntary.

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Result

Seventy eight patients who were newly diagnosed with pulmonary tuberculosis were enrolled in our study. male female ratio 5:1, the age group of the patients distributed as follow (20¬-39) 39.7%, (40-59) 37.2%, (60 and above) 23.1%.the mean age was 43.72.

Diagnosis of tuberculosis based on smear positive for AAFB was 69.2% and 30.8 % was diagnosed on the clinical and radiological background (smear negative).

By using FBG for diagnosis of diabetes 7.7 % of patients have IFG; which represents 10% of previously undiagnosed, and 5.1 % have diabetes representing 6.7 % of previously undiagnosed.

By using 2 HRPP 2.6 % have IGT, representing 3.3 % of previously undiagnosed, and 3.8 % diagnosed as diabetic representing 5 % of previously undiagnosed.

From both FBG &2HRPP 6.4% of the patients diagnosed having diabetes this represents 8.3% of previously undiagnosed.

All diabetics (known DM and newly diagnosed) are 29.5% so the Prevalence of DM among patients is 29.5 %.

56.5% of diabetic patients, the diagnosis of pulmonary TB among them based on smear positive and this represents 24.1% within the whole smear-positive patients.

43.5% of diabetics, the diagnosis pulmonary TB among them based on clinical presentation and radiological findings (smear negative), and this equals 41.7% of the whole smear-negative patients.

74.5% of non-diabetic patients were diagnosed with pulmonary TB based on smear-positive sputum. This is 75.9% of smear-positive patients.

25.5% of non-diabetic patients were diagnosed with pulmonary TB clinically (smear negative), and this represented 58.3% of whole smear negative. (Table 3)

66.7%of all patients who used alcohol were non-diabetics representing 21.8% of non-diabetic group.

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Prevalence of Diabetes among pulmonary TB

	Observed N	Expected N	
DM	23	39.0	
NOT DM	55	39.0	
Total	78		

P value (0.00)

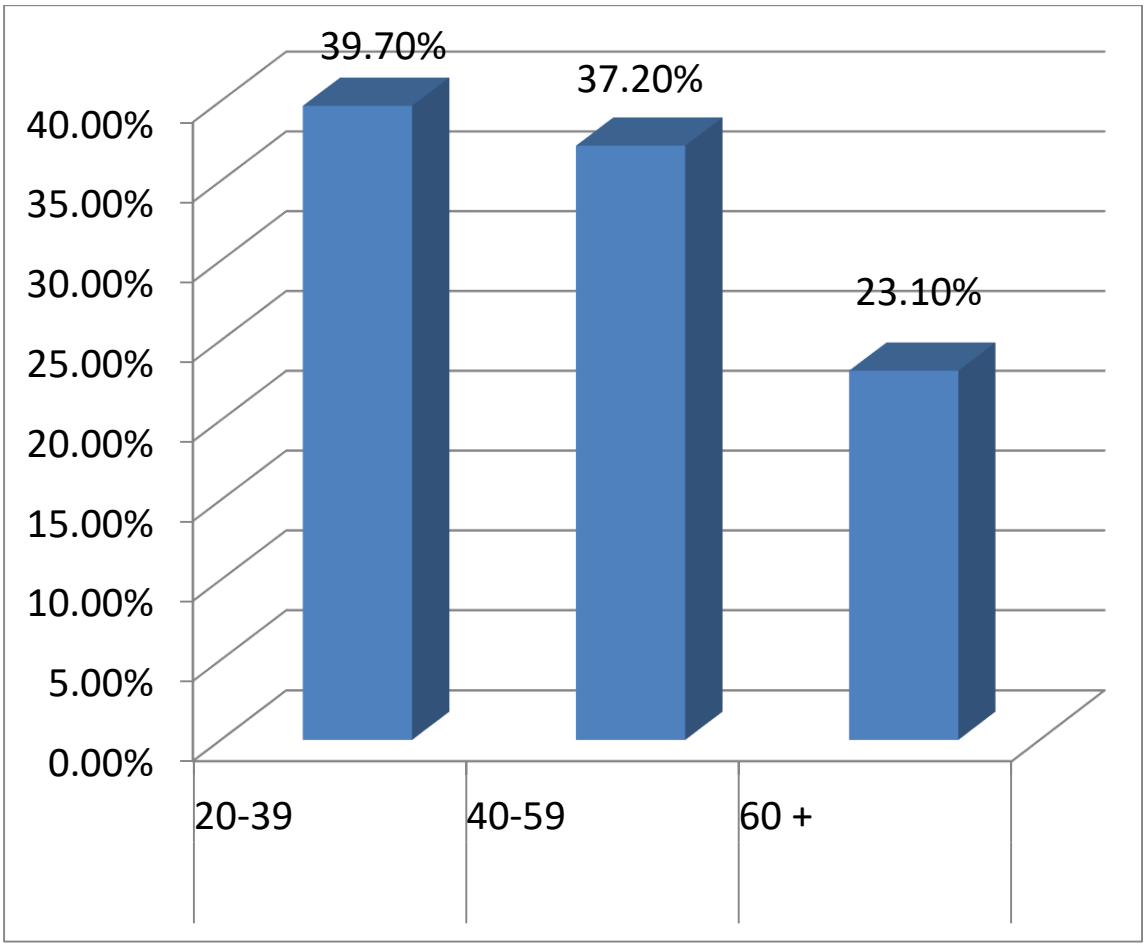

Figure 1: distribution according to age

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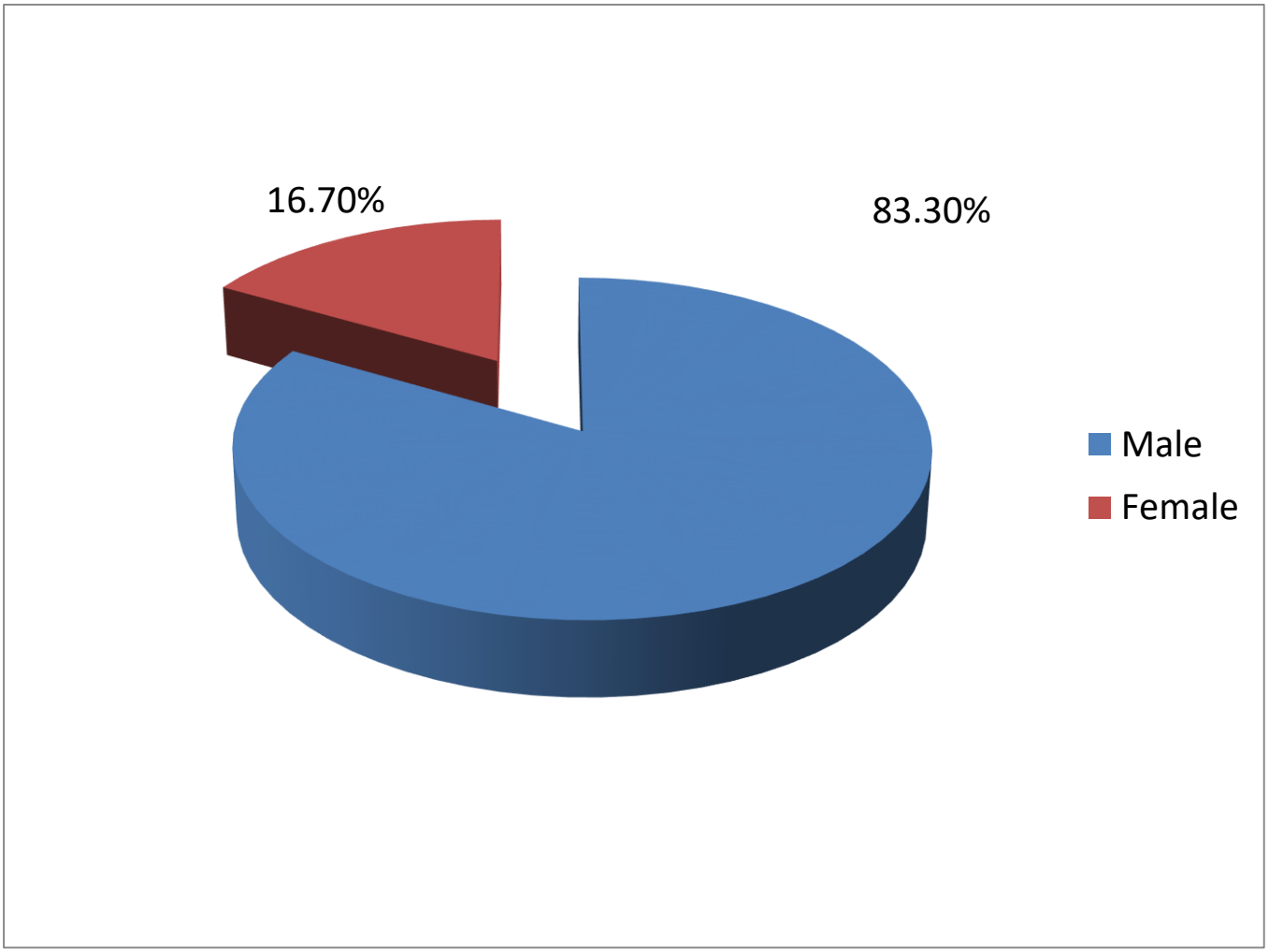

Figure 2: distribution according to gender

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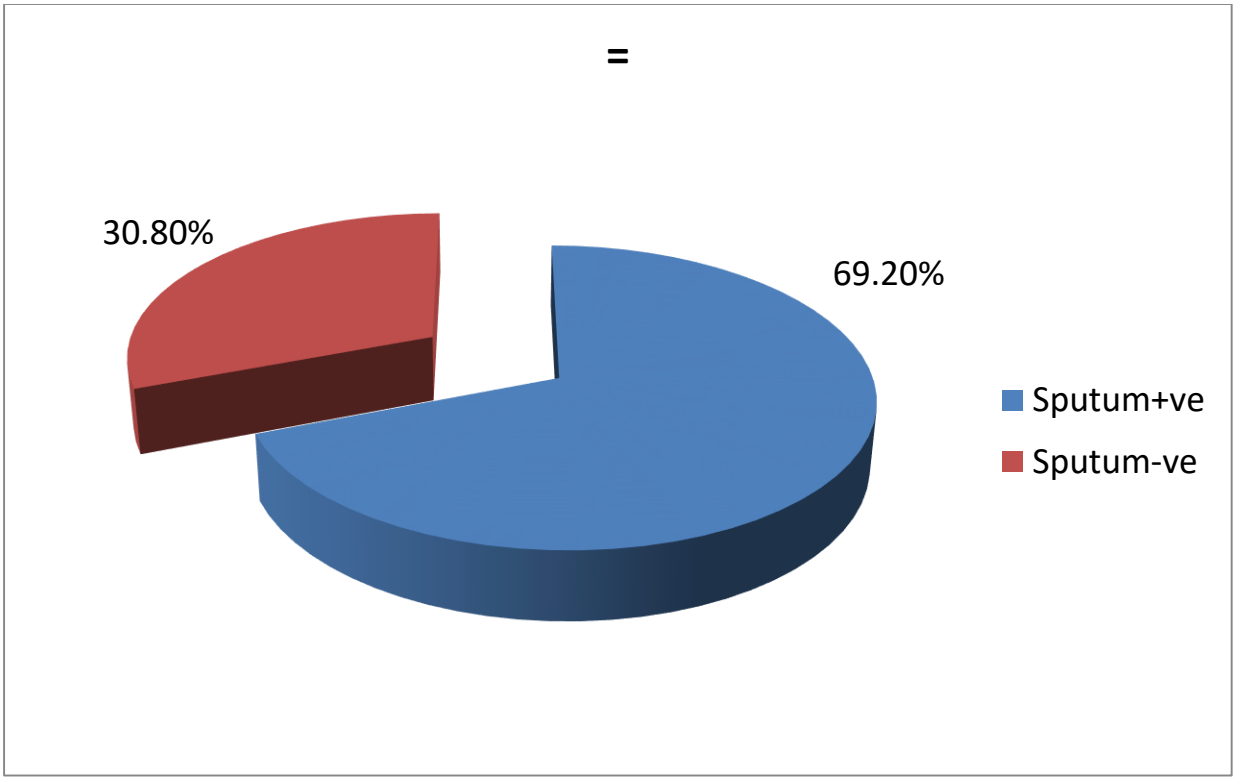

Figure 3: state of sputum testing for

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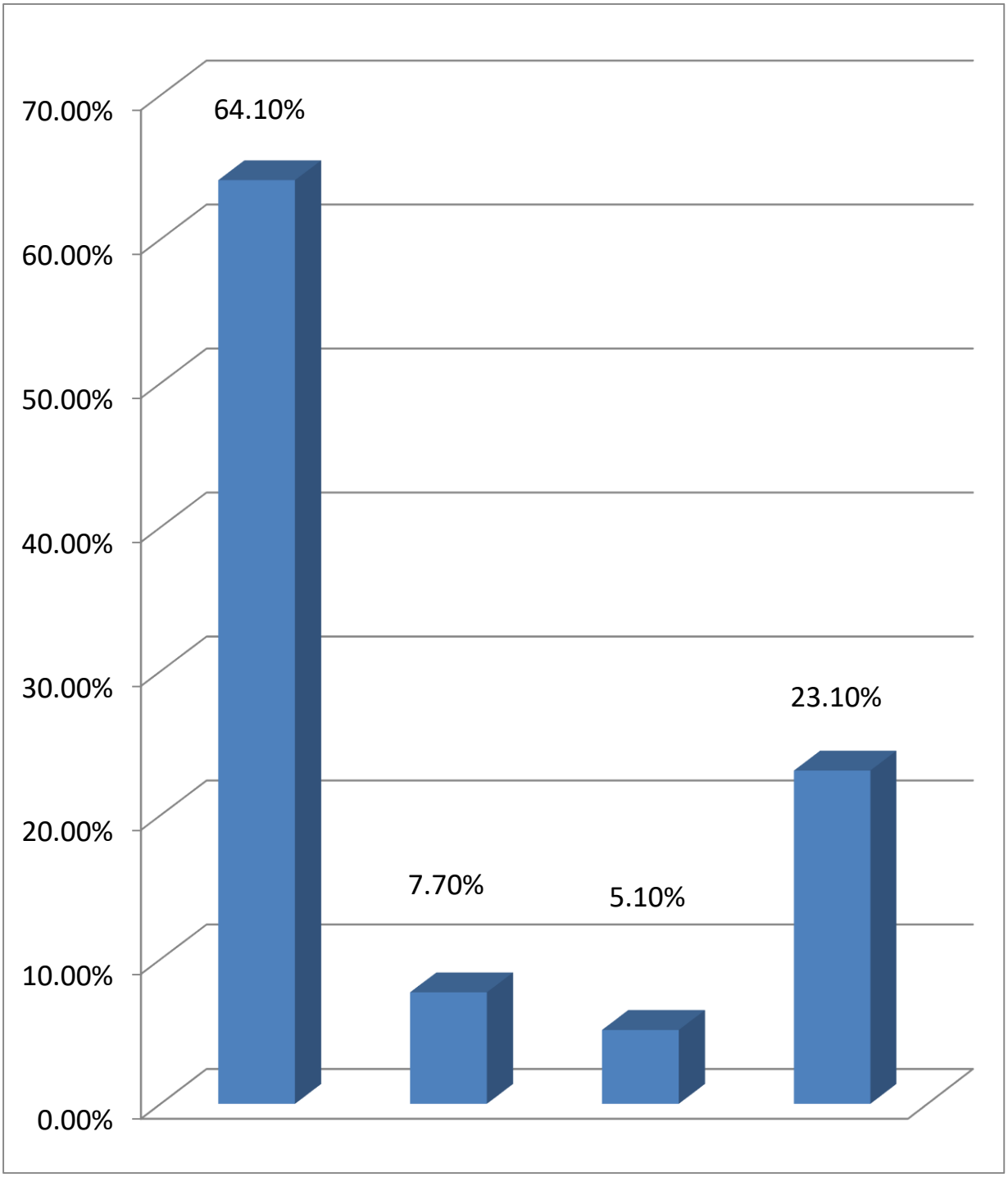

Figure 4: distribution of patients according to the initial FBG

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L Normal IFG DM Known DM

FBG <110 FBG >110< 126 FBG ≥ 126

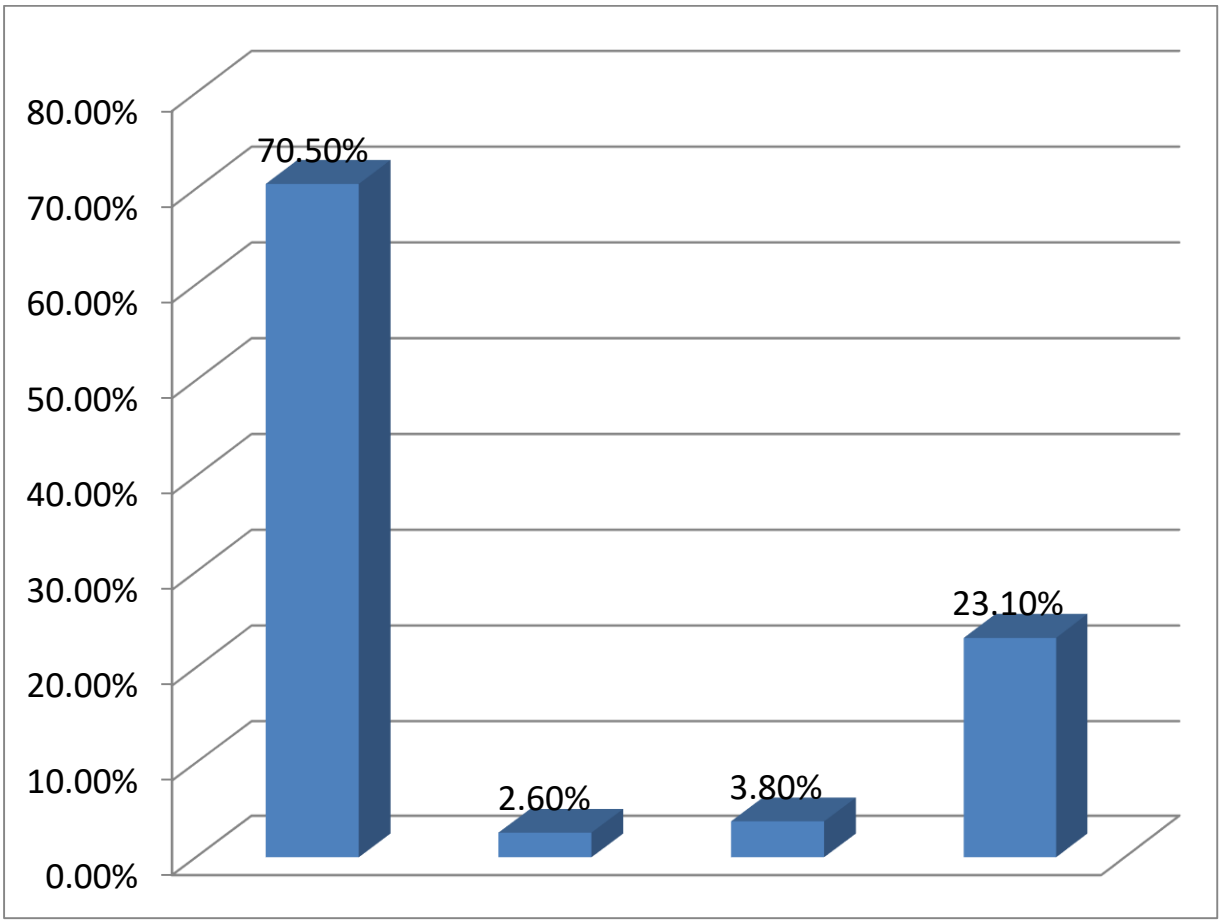

Figure 5: distribution of patients according to 2h PPG

Normal IGT DM Known DM

2HPPG <140 140-199 ≥200 mg/dl

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Discussion

We used the WHO criteria for the diagnosis of pulmonary TB that depend on an examination of sputum and clinical and radiological diagnosis when the sputum is negative. In our study 54 patients (69.2%) were diagnosed based on smear-positive sputum and 24pateeints (30.8%) were diagnosed clinically; this is similar to the Sudan NTP report (2010), 31% of the patients diagnosed clinically despite of negative smear. There is a bias in the diagnosis of TB by these methods because in certain conditions the smear may be falsely positive in atypical mycobacterium, dead bacilli, and techniques errors. Also, the clinical diagnosis has a degree of bias because many conditions mimic the clinical presentation of pulmonary TB. The use of culture in the diagnosis of tuberculosis will reduce this bias significantly because culture can be positive in smear-negative sputum and it can distinguish atypical mycobacterium.

The prevalence of DM among pulmonary TB patients from our study is 29.5 %(P value 0,00 which is significant,< 0.05), which is high, 23.1% were known diabetic and 6.4% were newly diagnosed and this represents 8.3% of previously undiagnosed patients. We have looked at FBG and 2HRPPBG for all non-diabetic patients. This revealed 7.7% with IFG and 2.6% with IGT. Although the Anti TB drugs can cause transient hyperglycemia, most patients are diagnosed as diabetic before they start the treatment. Regarding the diagnosis of TB among diabetic patients, 56.5% of them were smeared positive and 43.5% were smear-negative, while among non-diabetic it was 74.5%, 25.5% respectively, so diagnosis based on the clinical ground of TB was more among diabetic patients than non-diabetic patients and this increase the bias as mention above.

There is no similar study conducted in Sudan to compare our findings. To compare the prevalence of DM among pulmonary TB with that in the general population there is no large population-based study regarding the prevalence of DM in Sudan, but there is one study done in Dongla community in north Sudan that showed the prevalence of DM among adult to be 8.3% {Ramachandran, 2001 #1625}so the prevalence of DM in our study is three-fold that in the general population according to that study.

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When we compared the prevalence of DM in our study with the prevalence of DM globally which was 6% in 2007 for the age group (20 -79) years, we found that it is about fivefold the global prevalence.

In the comparison of the prevalence of DM in our study to a similar study done in Texas (USA) and northeastern Mexico, in which the prevalence of DM among new pulmonary TB patients was 39% and 36% respectively. This is three times that of the general population DM prevalence. From these data, we can conclude that our study revealed a high prevalence of diabetes among newly diagnosed pulmonary TB.

Regarding the other risk factors of TB, the study showed that 23.1% of the patients have used alcohol 1/3rd of them are diabetic, and 2/3rd not diabetic, so no difference between both groups in using alcohol. Only one patient has used drugs (1.3%). No patient has a positive HIV test, and unexpected in comparison with the study done in ELshaab hospital in 2005, in which the prevalence of HIV among TB patients was 14 %, but this may be due to the small size of our study. From these, the contribution of other risk factors is less in our patients.

The BMI of patients ranges between underweight 34.6%and normal weight 64.1%, only one patient (1.3%) is overweight and he is diabetic. 73.9% of diabetic patients have normal weight and 18.5%of them have underweight. Among non-diabetic patients, 60% were of normal weight, and 40% with underweight. if we take the BMI as an indicator of nutrition status (underweight is corresponding to malnutrition); the common risk of TB among non-diabetic patients is malnutrition. The study showed the prevalence of malnutrition (underweight) was more than the prevalence of DM but may be due to TB infection. Type 2 DM is known to have a higher incidence of obesity representing the basis of its pathogenetic mechanism of insulin resistance. In our study, only 1.3% of the patients were overweight compared to 34.6% underweight. This may raise the issue of previously quoted type 1 malnutrition-related diabetes.

Conclusion: The study revealed a high prevalence of diabetes among newly diagnosed pulmonary tuberculosis patients in Khartoum state (29.5%) and it is three times more than the prevalence of

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diabetes in Sudan. There is a limitation in the study due to bias in the diagnosis of tuberculosis, and the contribution of other risk factors of tuberculosis like malnutrition.

Also, the study showed that diabetes is neglected by the clinician, who treated tuberculosis because during investigations we found that 8.3% of previously undiagnosed patients were diabetic and they did not investigate before.

In examining risks for tuberculosis in non-diabetic patients, the study showed the common risk is malnutrition (34.6%), second is alcohol and all the patients were HIV negative.

Tuberculosis is common among young adults especially males and it is also common in less educated people with limited income.

Recommendation

All patients diagnosed with pulmonary tuberculosis must be investigated for diabetes mellitus and glucose intolerance, Diabetes mellitus is a risk factor for the development of pulmonary TB and tight blood sugar control may improve the outcome of pulmonary TB.

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