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The Prevalence of Pulmonary Tuberculosis Patients by Hematological Study at Fatima Jinnah Chest Hospital Lahore

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ABSTRACT

More than one third of the world's population is afflicted by tuberculosis (TB), an infectious disease that is persistent and debilitating. As the leading infectious disease killer worldwide, tuberculosis continues to be a significant public health issue in underdeveloped nations. The Fatima Jinnah Chest Hospital Brewery Road Quetta were the sites of this study. In this study, (n=200) patients were enrolled. Various groups were created for the study project based on the participants' socio-demographic characteristics. The primary goals of this study are to examine the hematological characteristics of tuberculosis patients in Balochistan prior to the conclusion of anti-tuberculosis treatment and to raise public knowledge of the appropriate venue for additional investigation and research. Depending on their ages, the patients were placed into three groups: Patients in Groups 1 and 2 are between the ages of 2 and 17; those in Group 3 are between the ages of 35 and 60. Anti-tuberculosis patients made up 63.50 percent of the unmarried and 36.50 percent of the married population. Patients made up all of the anti-tuberculosis patients. Anti-tuberculosis patients made up 52.00, 44.00, and 6.50 percent of those who weighed 30-60, 61-90, and 91-120 kg, respectively. 25% and 74.5 percent, respectively, of anti-tuberculosis patients were between 4.2 and 5.2 cm and 5.9 and 6.9 cm tall. However, employment rates for anti-tuberculosis patients were 37.50 and 62.50 percent, respectively. According to the results, 13.00, 3.50, 4.00, 1.50, 2.00, and 0.50 percent of them experienced these symptoms blood pressure, diabetes, depression, heart disease, and kidney disease and stomach issue, respectively.

Keywords: Prevalence, Tuberculosis, Hematology, Factors, Quetta.

INTRODUCTION

The disease tuberculosis is an old one. In 300 B.P. Hindu literatures, tuberculosis is referred to as "Rogaraj," the "king of diseases," and "Rajayakshma," the "disease of kings," but today it is known as tuberculosis. The tuberculosis disease is still the leading cause of death in many nations. The second name emphasises that "Tuberculosis" is a contagious disease that affects both royalty and commoners equally. National TB Programme (1997).

Mycobacterium tuberculosis is the causative ag**ent**

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tuberculosis disease. On March 24, 1882, "Mycobacterium tuberculosis" led to the discovery of Robert Koch. German scientist and physician "Robert Koch" was the name. "A disease caused by infection with Mycobacterium tuberculosis, the tubercle bacillus can damage any tissue or organs of the body, but the lungs are particularly afflicted by this disease," says the definition of tuberculosis. The bacteria Mycobacterium have a waxy covering. Cell surfaces often have waxy coats, which protect the cells from gramme staining. Ziehl Neelson can identify mycobacteria method of staining or acid-fast bacillus (AFB) stain. Four kinds of Mycobacterium tuberculosis are most commonly seen. The bacteria that cause tuberculosis include Mycobacterium bovis, Mycobacterium africanum, Micobacterium Canetti, and Mycobacterium microti. However, Mycobacterium tuberculosis is the cause of tuberculosis in humans. Mycobacteria are bacteria with high oxygen content. They take between 12 and 18 hours to incubate. Because mycobacteria have an acidic solution and a lipid cell wall, they are referred to as acid fast bacilli. Although these bacteria typically affect the lungs, they occasionally have been seen to attack the spine, kidney, bone, and brain. Other types of tuberculosis can be brought on by this pathogen, but pulmonary tuberculosis is the most prevalent. National Center for HIV/AIDS If tuberculosis is not treated appropriately; it can be fatal (2014). Numerous hematological parameters can be changed in the patients suffering from tuberculosis such as the decrease quantity of the hemoglobin and the count of the lymphocyte decrease etc. (Akhtar et al., 2021).

Tuberculosis

The bacilli that cause the contagious chronic disease tuberculosis are members of the Mycobacterium genus. These smaller size animals, known as Acid-Fast Bacilli (AFB), have the characteristic of sharing aniline color (for example, carbolfuschin) significantly after decolorization with corrosive and alcohol. This is due to the wax and fat that can be found in their cell walls (Angria et al., 2022). Mycobacterium tuberculosis is the most important bacterium responsible for TB illness. Other bacilli, such as Mycobacterium africanum, which occasionally appears in West Africa, and Mycobacterium bovis, which causes TB in domestic or wild cows but can also cause tuberculosis in humans, are occasionally responsible for TB. Mycobacterium TB, Mycobactrerium africanum, Mycobacterium bovis, and Mycobacterium microti are the four bacteria thought to be part of the M. tuberculosis complex (Anser et al., 2014).

Tuberculosis types

There are two types of tuberculosis based on how irresistible they are: (a) pneumonic tuberculosis, which accounts for 80% of all cases and is the irresistible type of the disease; and (b) less common, non-irresistible extra-aspiratory TB, which can affect any part of the body other than the lungs, including the lymph nodes, spine, pericardium, pleura, joints (Chen et al., 2021). Sputum smear-positive or -negative sputum smear is another name for pneumonic tuberculosis. Due of the irresistible nature of aspiratory TB, a patient who has both pneumonic and extra-aspiratory TB should be assigned an instance (Bansal et al., 2022).

Spread of Tuberculosis

PTB patients are the most contagious cases and the main source of Mycobacterium tuberculosis. An individual with tuberculosis of the lungs exhaling microorganisms into the air in small droplets when talking, coughing, laughing, or sneezing is the most significant basis of infection because the route of transfer of the bacilli is largely via vaporizer (Chitale et al., 2022). The bacillus, Mycobacterium bovis, can occasionally be acquired by humans from diseased cows by consuming unclean milk. This second form of transmission is uncommon in affluent nations due to the widespread pasteurisation of milk and the ability to manage tuberculosis in livestock, but it is still a major issue in developing nations (Chitnis et al., 2022).

Pathogenesis

Primary infection

Primary infection is the term used to describe the disease that develops when a healthy person comes into touch with the tubercle bacillus for the first time and becomes infected. When droplet nuclei are inhaled into the lung, some of them may not be stopped by the bronchi's mucociliary defence and may end up in the lungs' irreversible alveoli. Here, the tubercle bacilli begin to grow and develop into a little sub pleural lesion known as the Ghon centre. Additionally, bacteria are quickly transported to the local lymph nodes known as hilar lymph nodes. The so-called primary compound is made up of the Ghon focus and the associated hilar lymphadenopathy (Chopra et al., 2022). About 85 to 90 percent of the time, the main complex heals spontaneously within one to two months. As a result, the patient develops a latent infection, which may only show up on radiographs as self-healing TB or result in a positive tuberculin skin test (Cui et al., 2022). The infection of a healthy person with the tubercle bacillus is typically asymptomatic and goes unrecognized. Its presence is detected by a shift in the Mantoux test from negative to positive, which represents an immunological response to the injection and shows that a person had previously been exposed to the bacteria (Haslett, 2002). A little amount of "tuberculin," a protein generated from M. tuberculosis, is injected intracutaneously into the patients during the Mantoux test, which is a tuberculin skin test. The length of the incubation period over the injection site is taken into account after two days (Chopra et al., 2022).

Primary Tuberculosis

The development of tuberculosis in a patient, who has previously been exposed to the tubercle bacillus, is known as post-primary tuberculosi. After a dormant period of months or even years following primary infection, post primary TB can grow. This may happen if dormant bacteria that have been present in tissues for months or even years begin to grow. It can happen if a person infects a patient who has already been exposed to bacteria and neutralised it (Davuluri et al., 2022). For those who are HIV negative, the lifetime chance of developing post-primary tuberculosis is just approximately 5%; for those who are HIV positive, the risk is between 50% and 60% (Dastani et al., 2022; Xia et al., 2022b).

Epidemiologic etiology

The following simplified model of the pathogenesis of tuberculosis makes it easier to examine the dynamics of an epidemic of the disease in a society. The model shows four separate steps: exposure, infection, illness, and mortality (Dawson et al., 2022; Zhang et al., 2029). Three factors determine the likelihood that a vulnerable contact will be exposed to tubercle bacilli. The number of incident infectious cases in the community, the length of time that these instances are contagious, and the number and kind of interactions between a case and a susceptible contact per unit of infectiousness come first, second, and third, respectively. The risk rises when the incidence of infectious cases rises, as does the length of their infectiousness, and as does the number of interactions with susceptible contacts per unit of time (D, Liyun et al., 2022).

TB's natural course of infection

The course a patient with tuberculosis will take in the absence of therapy is known as the natural history of the disease. It has been demonstrated that, in the absence of treatment, after a period of one and a half years, roughly one-quarter of patients pass away, half of those who do survive develop chronic infections and continue to excrete bacteria for many years, and the remaining patients are spontaneously cured by the body's defense mechanism. By the end of five years, 50% more patients are dead than alive (Hong et al., 2021). A review conducted in 2011 found that case fatality predictions in 10 years were

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70% for smear-positive and 20% for smear-negative culture positive tuberculosis, despite the review's significant shortcomings (Jegede et al., 2020).

Prevalence of Tuberculosis

In nations with a relatively high burden of tuberculosis, national wide population-base surveys can directly assess the prevalence of bacteriologically confirmed pulmonary tuberculosis (around 100 cases per 100000 populations or more). A nationwide estimate of tuberculosis prevalence that takes into account all forms can be created using the survey's findings. Repeated surveys must be carried out, for example, every 10 years, in order to monitor trends in the burden of tuberculosis (Vashakidze et al., 2022). However, in low-income countries the nations that are also most impacted by tuberculosis the cost of the surveys and the high sample numbers required in recurrent surveys make this exercise very difficult. Without a survey, the prevalence of tuberculosis may only be indirectly calculated by multiplying the incidence by the average length of the illness, but this method is fraught with ambiguity (Wang et al., 2016).

Incidence of Tuberculosis

Tuberculosis incidence measurement at the national level necessitates long-term research with large cohorts of participants, which are expensive and logistically difficult. Because of this, the incidence of tuberculosis has never been evaluated on a nationwide scale. If there is rigorous surveillance of the study population to discover new cases that die or migrate out in between prevalence surveys, tuberculosis incidence can be indirectly approximated using nation notifications of tuberculosis cases and also through numerous prevalence of studies. However, this only works in nations with effective monitoring systems and where access to high-quality healthcare means that few instances go undiagnosed. Since these prerequisites are frequently not met in many nations, incidence estimates in these nations are calculated using notification data and expert judgement (Wang et al., 2022a).

Tuberculosis Mortality

Measurement of tuberculosis mortality among HIV-negative individuals can be done simply using data from the national vital registry system. However, this is only possible if the most recent revision of the International classification of illnesses (ICD-10) is used to accurately identify causes of death and the vital registration systems have a high coverage rate (Wang et al., 2022b). Even with vital registration systems in place, tuberculosis mortality among HIV-positive individuals is difficult to quantify since deaths among HIV-positive individuals are categorised as HIV deaths and contributory reasons (such as tuberculosis) are frequently not accurately reported (Xia et al., 2022a). We would anticipate that more than 90% of all tuberculosis deaths in countries with effective vital registration systems would be recorded (Zhang et al., 2022a). Verbal autopsy data can be used to estimate tuberculosis mortality in the absence of a reliable vital registration system, but there are significant differences between and within sites because of the limited numbers of fatalities covered and the different diagnostic definitions and algorithms (Akhtar et al., 2023).

Aim and Objectives

- To determine the hematological parameters between different age groups before starting of the anti-tuberculosis treatment (ATT).
- The assessment of Anemia in TB patients before the starting of the intensive phase treatment.

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MATERIAL AND METHOD

Design of Research
This research project was carried out in the Fatima Jinnah institute of Chest diseases Brewery road Quetta.

Study Population
This study was included (n=200) hundred patients of Balochistan. The study project was divided into different group according to their socio-demographic variables

Research Performa
The research data were gathered using a well-defined questioner in accordance with the intended study's scope and statistical analysis.

Inclusion Criteria
Choosing participants before the ATT begins (Anti-tuberculosis treatment). The patients were selected during the treatment phase in environmental and physiological considerations.

Exclusion Criteria
The study did not include tuberculosis patients who had completed treatment.

Study Purpose
The primary goals of this study were to examine the haematological characteristics of tuberculosis patients in Balochistan prior to the conclusion of anti-tuberculosis treatment and to raise public knowledge of the appropriate venue for additional investigation and research.

Study Subject Distribution
The patients were divided into three groups according to their age

Group – (1)
Patients in between 2-17 year of age

Group - (2)
Patients in between 17-35 year of age

Group – (3)
Patients in between 35-60 years of age the patients were divided into groups based on their socio-demographic characteristics in order to conduct a thorough investigation.

Procedure
In a test tube containing EDTA, blood samples from the chosen patients were taken. Through the use of a homogenizer device, the blood was adequately homogenised. The test tube was put in the haematology analyzer while the operator awaited the outcome.

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Haematological Characteristics

The Complete Blood Count (CBC)

White blood cell	WBC
Red blood cells	RBC
Hemoglobin concentration	Hgb
Hematocrit	Hct
Mean cell volume	MCV
Mean cell hemoglobin	MCH
Mean cell hemoglobin concentration	MCHC
Platelet count	Plt

Statistical Analysis

Data analysis was analyzed on SPSS 22, version software. The analysis of variance was calculated to determine whether there were any significant differences between the treatments.

RESULTS AND DISCUSSION

The 200 anti-tuberculosis patients that were chosen for this study's sample had the following socio-demographic characteristics.

Gender

The gender distribution of the anti-tuberculosis participants in the current investigation is shown in Table 1. The statistics indicated that equally 50% of male and female participants were chosen for the current study.

Academic Status

The educational background of the anti-tuberculosis participants in the current investigation is shown in Table 1 below. The findings showed that 67.00% of anti-tuberculosis patients lacked a high school diploma or equivalent, whereas 33.00% did.

Marital status

Marital status Table 1 of this study's anti-tuberculosis participants' data lists their marital status. According to the findings, only 63.50 percent of anti-tuberculosis patients were married, whereas 36.50 percent of them were.

Body weight (kg)

Table 1 shows the body weight distribution of the anti-tuberculosis trial participants. The results showed that, correspondingly, 52.00, 44.00, and 6.50 percent of anti-tuberculosis patients were weighing 30-60, 61-90, and 91-120 kg.

Height (cm)

In the Table 1 displays the height distribution of the anti-tuberculosis participants in the current investigation. The results showed that 25.50 and 74.50 percent of anti-tuberculosis patients had heights of 4.2-5.2 cm and 5.3-6.9 cm, respectively.

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Economic situation

Economic situation Table 1 of the current study's anti-tuberculosis participants' economic situations is provided. The findings showed that among anti-tuberculosis patients, 37.50 and 62.50 percent were employed and jobless, respectively.

Working hours

The results of anti-tuberculosis patients were evaluated with regard to working hours, and the information is shown in Table-1. The findings show that, respectively, 31.50, 48.50, and 20.00 percent of anti-tuberculosis patients worked up to 3, 10, and 11–14 hours per week.

Status of health

The data is shown in Table 1 along with the findings about the health status of anti-tuberculosis patients. According to the result of them had high blood pressure, diabetes, depression, heart disease, kidney illness, or stomach problems, respectively.

Table-1: Socio-demographic characteristics of the anti-tuberculosis patients (n=200) selected in this study.

Variable	Frequency	Percentage
Gender		
Male	100	50.00
Female	100	50.00
Educational status		
Educated	66	33.00
Uneducated	134	67.00
Marital status		
Married	73	36.50
Unmarried	127	63.50
Ethnicity		
Patients	200	100.00
Body weight (kg)		
30-60 kg	104	52.00
61-90 kg	88	44.00
91-120 kg	13	6.50
Height (cm)		
4.2-5.2	51	25.50
5.3-6.9	149	74.50
Economic status		
Employed	75	37.50
Unemployed	125	62.50
Working hours		
3-6	63	31.50
7-10	97	48.50
11-14	40	20.00

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Sleeping hours		
5-8	116	58.00
9-12	72	36.00
13-16	12	6.00
Disease		
Blood pressure	26	13.00
Diabetes	7	3.50
Depression	8	4.00
Heart disease	3	1.50
Kidney disease	4	2.00
Stomach issue	1	0.50
No disease	151	75.50

Complete Blood Count of Anti-Tuberculosis Patients Under Different Age Groups

WBC count

Figure 1 displays the results of the WBC count for patients receiving anti-tuberculosis treatment in various age groups. According to the statistics, anti-tuberculosis patients with high WBC counts (8.77) are generally between the ages of 17 and 35, with WBC counts in the 2 to 17 age range coming in second (7.99). In anti-tuberculosis patients who are between the ages of 35 and 60, a low WBC count of 6.89 was found. The results of the data's statistical analysis show that the WBC count varied significantly (P 0.05) between the various anti-tuberculosis age groups. The bars with different letters in the mean values show that, at P<0.05, there are significant differences between the age groups.

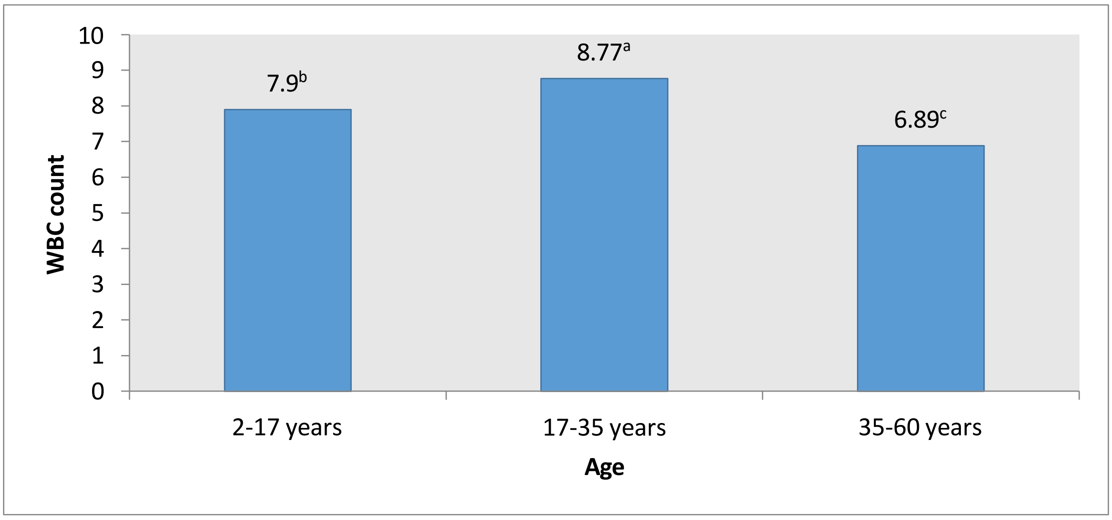

Figure-1: WBC count in different age groups of anti-tuberculosis patients

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MON count

Displays the results in Figure 2 of the MON count in various age groups of anti-tuberculosis patients. The data reveals that anti-tuberculosis patients between the ages of 2 and 17 had the highest MON count (0.64), followed by those between the ages of 17 and 35. (0.60). The anti-tuberculosis patient population was found to have a low MON count (0.54) while they were between the ages of 35 and 60. According to a statistical examination of the data, there were significant (p0.05) differences in MON count between the various age groups of anti-tuberculosis. The mean values in the bars with different letters indicate they are significantly different among the age groups at P<0.05

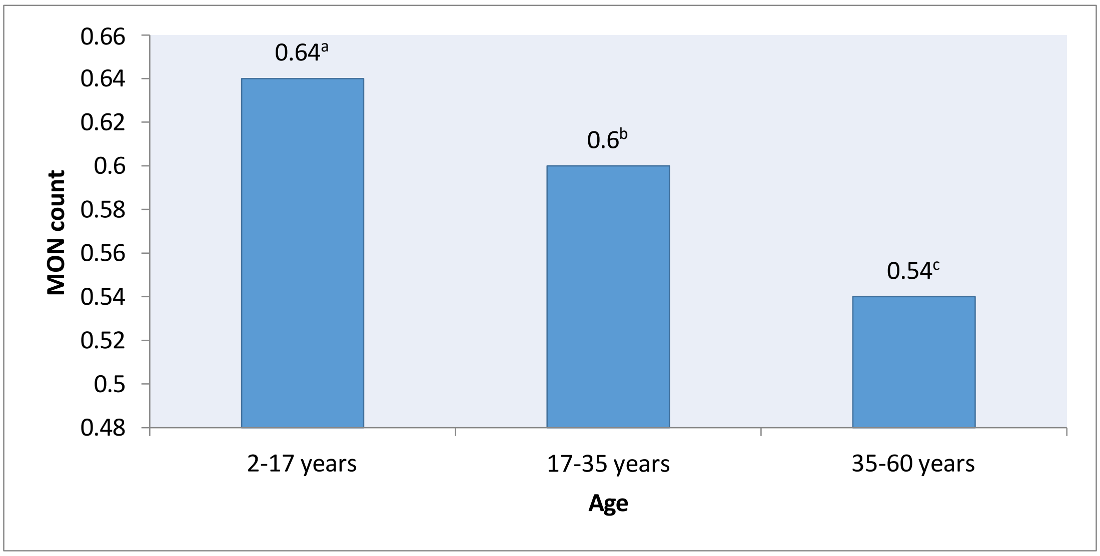

Figure-2: MON count in different age groups of anti-tuberculosis patients

LYM%

Results on LYM% in different age groups of anti-tuberculosis patients are presented in Figure-3. The data reveals that anti-tuberculosis patients between the ages of 17 and 35 had the highest levels of LYM% (27), with those between the ages of 2 and 17 having the lowest levels of LYM% (23.55). The low LYM% (22.76) was found in anti-tuberculosis patients who were between the ages of 35 and 60. According to a statistical examination of the data, there was a significant (P0.05) difference in LYM% across the various age groups of anti-tuberculosis.

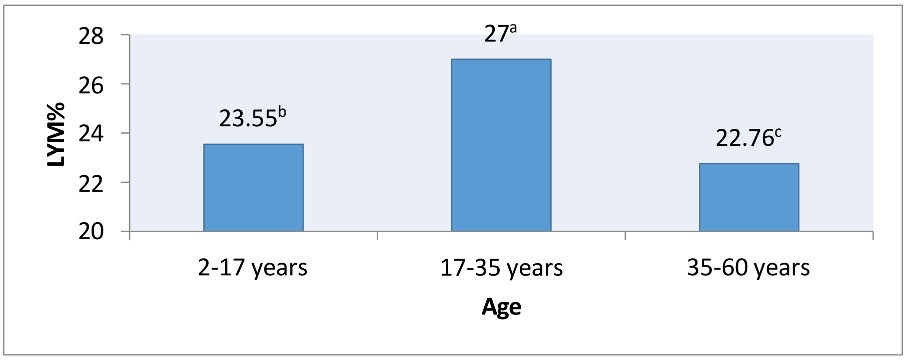

Figure-3: LYM% count in different age groups of anti-tuberculosis patients

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MON%

Results on MON% in different age groups of anti-tuberculosis patients are presented in Figure-4. The data shows that high level of MON% (9.22) was observed in anti-tuberculosis patient lies between 17-35 years of age followed by 2-17 years of age with MON% (8.29). The low level of MON% (7.37) was observed in anti-tuberculosis patient fall in between 35-60 years of age. Statistical analysis of the obtained data indicates that there was significant ($p<0.05$) difference in MON% among the different age groups of anti-tuberculosis.

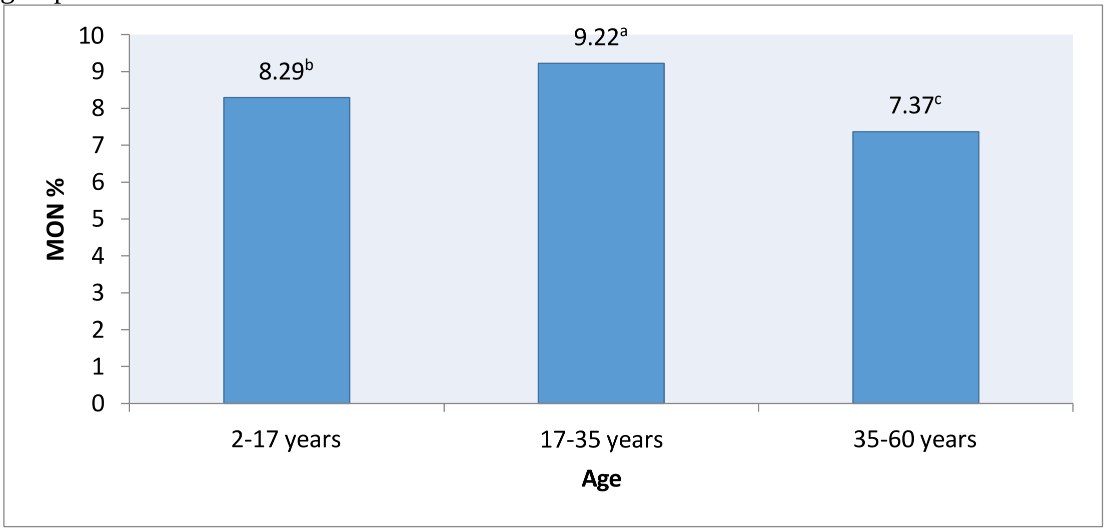

Figure-4: MON% count in different age groups of anti-tuberculosis patients

RBC count

Results on RBC count in different age groups of anti-tuberculosis patients are presented in Figure-5. According to the statistics, anti-tuberculosis patients between the ages of 17 and 35 had the highest RBC count (5.8), while those between the ages of 2 and 17 had the lowest RBC count (5.51). The anti-tuberculosis patients with the low RBC count (3.1) were between the ages of 35 and 60. According to a statistical examination of the data, there were differences in RBC count across the various age groups of anti-tuberculosis that were significant (p0.05).

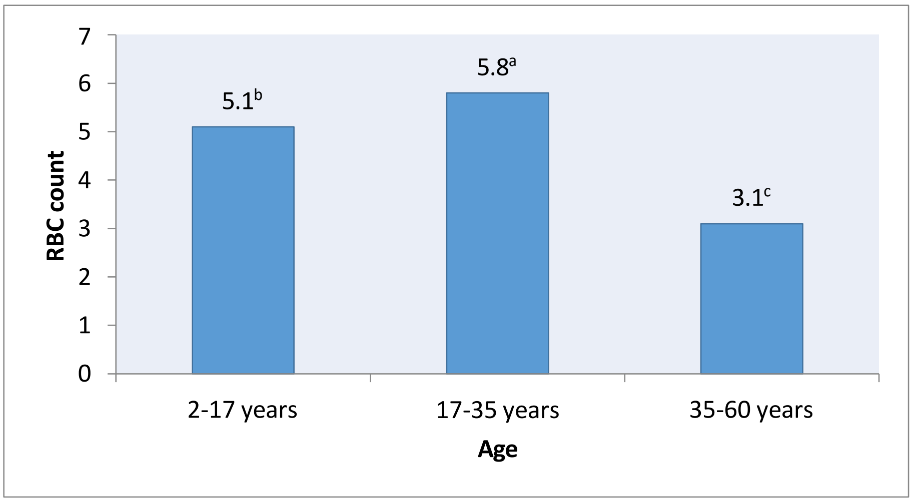

Figure-5: RBC count in different age groups of anti-tuberculosis patients

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HGB count

Figure 6 displays the results of the HGB count in various age groups of anti-tuberculosis patients. According to the statistics, anti-tuberculosis patients between the ages of 17 and 35 had the highest HGB count (13.21) and those between the ages of 2 and 17 had the lowest HGB count (12.04). The low HGB count (11.89) was found in anti-tuberculosis patients who were between the ages of 35 and 60. According to a statistical examination of the data, there was a significant (p0.05) difference in the HGB count between the various anti-tuberculosis age groups.

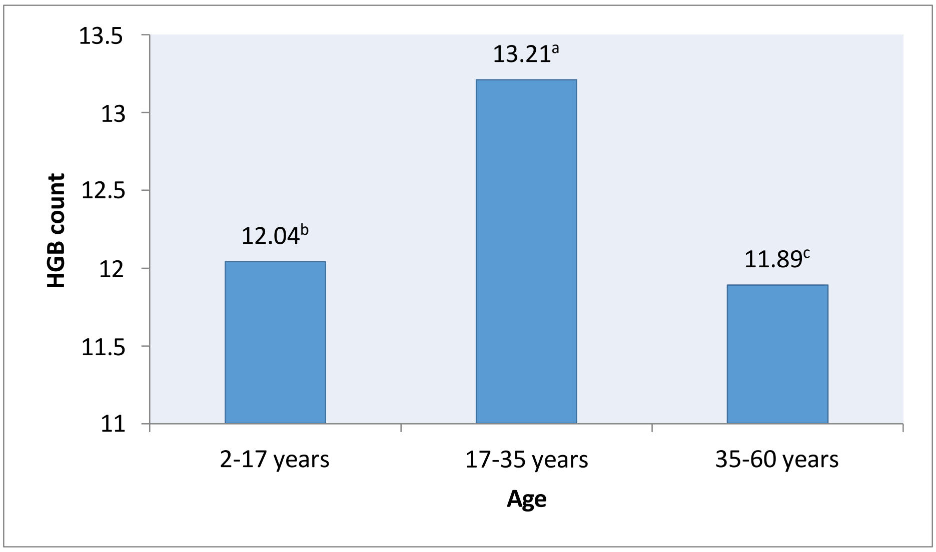

Figure-6: HGB count in different age groups of anti-tuberculosis patients

CONCLUSION AND RECOMMENDATIONS

Conclusion

The primary goals of this study were examine the haematological characteristics of tuberculosis patients in Balochistan prior to the conclusion of anti-tuberculosis treatment and to raise public knowledge of the appropriate venue for additional investigation and research. Depending on their ages, the patients were placed into three groups: Patients in Group 1 are between the ages of 2 and 17; those in Groups 2 and 3 are between the ages of 17 and 35; and those between the ages of 35 and 60. The data's socioeconomic analysis revealed that equally 50 percent of men and women were chosen for the current study. Approximately 33.00% and 67.00%, respectively, of anti-tuberculosis patients had some form of education. The result indicates that 13.00, 3.50, 4.00, 1.50, 2.00 and 0.50 percent of them was suffered from blood pressure, diabetes, depression, heart disease, kidney disease and stomach issue, respectively. The blood profile picture of patients indicates that high level of WBC count (8.77), LYM count (1.79), MON count (0.64), GRA count (6.61), LYM% (27), MON% (9.22), GRA% (69.94), RBC count (5.8), HGB count (13.21), HCT count (40.35), MCV count (73.38), MCH count (23.81), MCHC count (32.73), RDWS count (42.34), RDWC count (19.32), PLT count (353.39), PCT count (0.39), MPV count (7.34), PDWS count (10.31), PDWC count (36.04), P-LCC count (66.08) and P-LCR count (20.73) was observed in anti-tuberculosis patient lies between 17-35 years of age followed by 2-17 years of age with WBC count (7.99), LYM count (1.66), MON count (0.60), GRA count (5.52)..

Recommendation

This is recommended and suggested that this study further may proceed, with different aspects and focuses the ground realities of different arease, and must be focus other objectives which are causing problems on university students. In view of the varied hematological abnormalities observed in patients with tuberculosis in patients of this geographical location To reduce the likelihood of the disease spreading, strong awareness campaigns should be established in rural areas and the differential diagnosis of tuberculosis should be considered in patients with a variety of hematological anomalies.

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