



## Study To Correlate Low Mid Upper Arm Circumference In Tuberculosis Patients

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### Abstract

#### Introduction

Lower MUAC causes a higher risk of Tuberculosis infection. Individual with lower Mid upper arm circumference have a greater susceptibility to developing TB and worse disease progression if infected with TB.

#### Materials and methods

All patients of age >14 of either sex with diagnosed TB (pulmonary or extra pulmonary) are taken as cases and control in whom TB was rule out. Total of 50 cases and control were collected from MGM Hospital from the department of Respiratory Medicine from December 2017 to October 2019

#### Result

In our study majority of the cases having lower Mid Upper Arm Circumference (<19CM), 36% of cases are classified as sever undernourished, 52% is moderate undernourished and rest 12% is normal nourished, in comparison to control group having 28%, 26% and 48% respectively.

#### Conclusion

Lower Mid Upper Arm Circumference is more prevalent in case population, a higher proportion of patient suffering from TB having lower Mid Upper Arm Circumference indicating undernourished, this signifies the role of under nourishment in immuno modulatory response.

**Keywords:** Mid upper arm circumference, Tuberculosis, undernutrition

#### Introduction

Tuberculosis (TB) has affected human for thousands of years. TB is of two types pulmonary and extra pulmonary. Lower Mid Upper Arm Circumference causes a higher risk of TB infection. Individual with lower Mid upper arm circumference have a greater susceptibility to developing TB and worse disease progressive if infected with TB.<sup>[1]</sup>

Mid Upper Arm Circumference for adult can be used to grade the degree of body wasting in adult. The circumference of upper arm is measured at the mid-point. This is located by flexing the elbow at 90

degree with palm facing upward. Now, located the ipsilateral tip of the acromion process at the shoulder and olecranon process of the ulna at the elbow. Measuring tape is placed between these two points and mid-point is identified between these two.

**Appropriate cut- off point of Mid upper arm circumference for adult**

Male >-23cm - normal

Female >-22cm - normal

There are no standard Mid Upper Arm Circumference cut off for different grades of adult undernutrition. In WHO integrated management of

adolescent and adult illness, a cut off if Mid Upper Arm Circumference <16 cm was used to define severe undernutrition.<sup>[2]</sup> However, a cut off of less than 16cm would correspond to a situation of virtually no peripheral energy stores and excess mortality has been seen at levels of Mid Upper Arm Circumference which are higher than this cut off in patient with active TB.

Suggested cut off for Mid Upper Arm Circumference for moderate – severe undernutrition in adult.<sup>[2]</sup>

Mid Upper Arm Circumference <19cm – severe undernutrition

Mid Upper Arm Circumference 19- 22cm -moderate acute undernutrition

**Materials And Methods**

**Study design** – prospective observation study

**Study population** – case comprised of all patient (age > 14yrs) of either sex detected having pulmonary or extra pulmonary TB or both and control comprised, healthy individuals and patient in whom TB has been ruled out

**Sample size** - 50 cases and 50 controls

**Inclusion criteria**

Patients with Tuberculosis with age more than 14 years, of either sex

Patients without tuberculosis with age more than 14 years, of either sex

**Exclusion criteria**

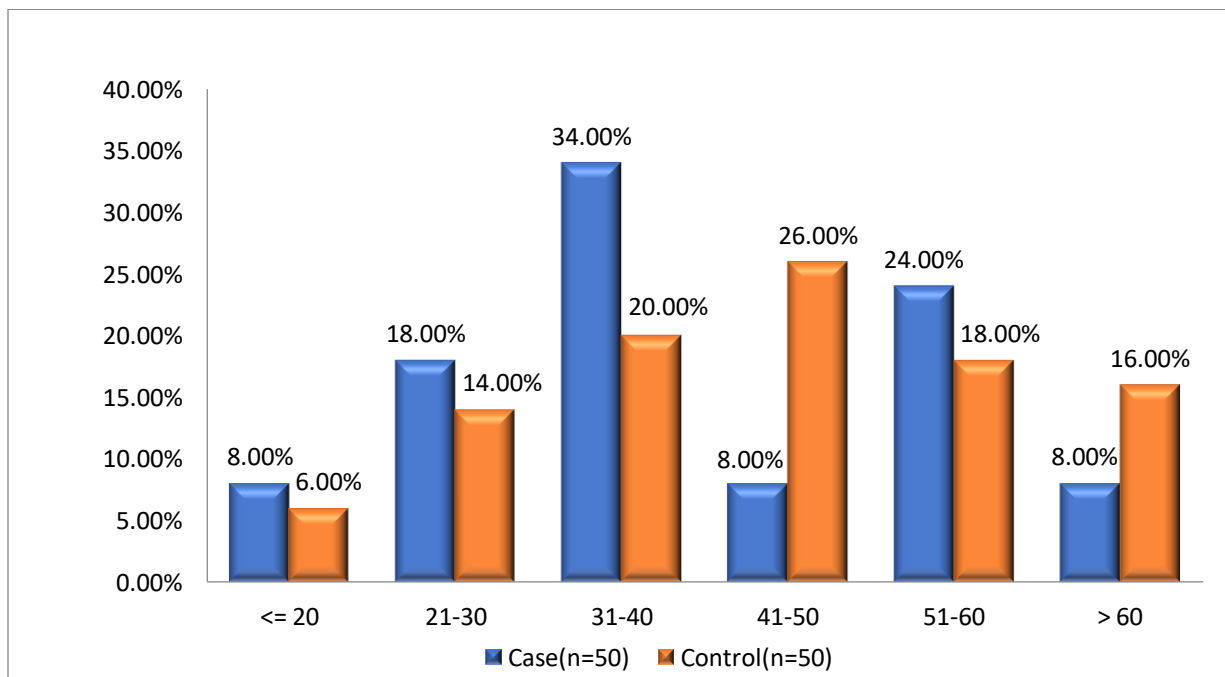
Patients with Tuberculosis below 14 years, of either sex

Patient without Tuberculosis below 14 years, of either sex

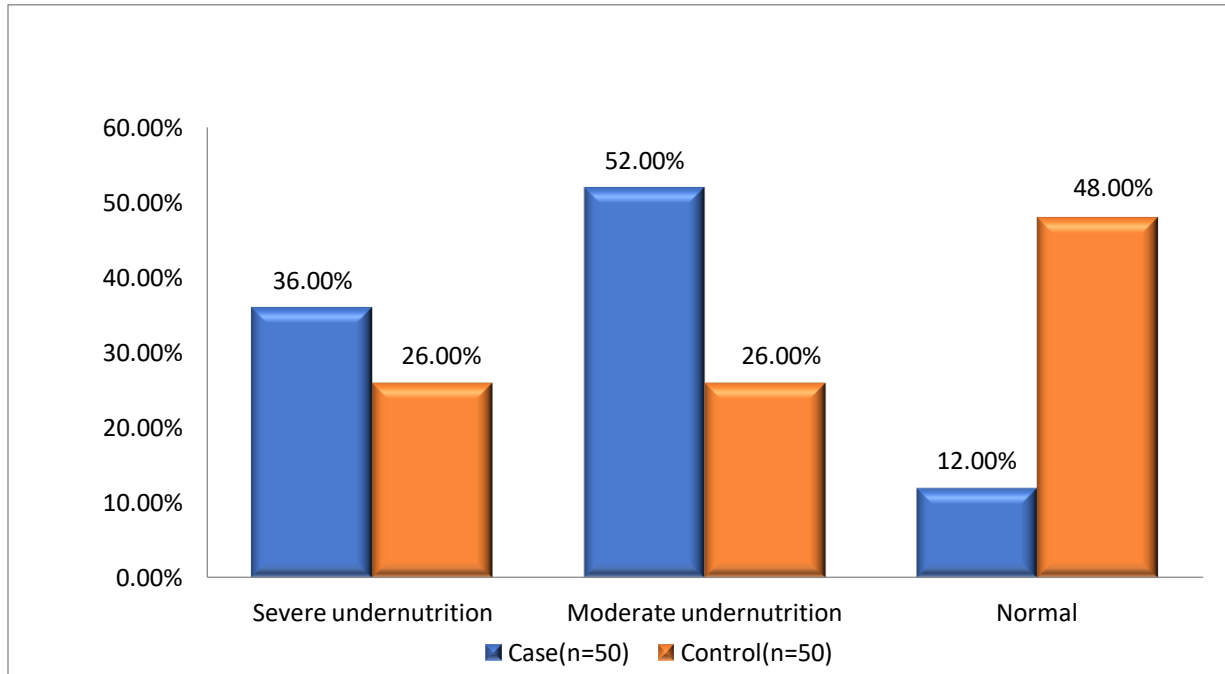
**Ethical review-** The study protocol was approved by the ethics committees of MGM medical college.

**Statistical analysis** – If the p- value was <0.05, then the results were considered as not statistically significant. Data were analyzed using SPSS software v.21 (IBM statistics, Chicago, USA) and Microsoft office 2007.

**Graph 1: Comparison of age distribution between groups**



**Graph 2: Comparison Mid upper arm circumference between case and control**



**Table 1: Comparison of age distribution between groups**

Age Distribution (years)	Group		Total	P value
	Case(n=50)	Control (n=50)		
<= 20	4 (8.00%)	3 (6.00%)	7 (7.00%)	0.120
21-30	9 (18.00%)	7 (14.00%)	16 (16.00%)	
31-40	17 (34.00%)	10 (20.00%)	27 (27.00%)	
41-50	4 (8.00%)	13 (26.00%)	17 (17.00%)	
51-60	12 (24.00%)	9 (18.00%)	21 (21.00%)	
> 60	4 (8.00%)	8 (16.00%)	12 (12.00%)	
Mean ± St dev	40.6 ± 14.69	44.58 ± 14.99	42.59 ± 14.90	0.180
Median (IQR)	35 (30-53)	45 (32-54)	41 (32-53.50)	

**Table 2: Comparison of Mid upper arm circumference between case and control**

Mid upper arm circumference (cm)	Group		Total	P value
	Case(n=50)	Control (n=50)		
Severe under nutrition	18 (36.00%)	13 (26.00%)	31 (31.00%)	0.003
Moderate under nutrition	26 (52.00%)	13 (26.00%)	39 (39.00%)	
Normal	6 (12.00%)	24 (48.00%)	30 (30.00%)	
Mean± St dev	19.22 ± 3.52	21.02 ± 4.95	20.12 ± 4.37	

<b>Median (IQR)</b>	20 (18-22)	22 (18-24)	20 (18-24)	0.005
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## Result

Mean value of Mid upper arm circumference was significantly more in control as compared to cases, 21.0±4.95cm in control and 19.22±3.52cm in cases. Also, on categorization of Mid upper arm circumference as severe under nutrition, moderate under nutrition and normal nutrition level, significant difference was seen in the distribution between cases and control (p value=0.0003). Around 48% of the controls had normal Mid upper arm circumference as compared to 12 % of cases. On the other hand, 52% and 36% of the patients were moderate or severe under nutrition respectively as compared to 26% of control each. So, it can be concluded that patients with normal Mid upper arm circumference was significantly higher in control as compared to case.

## Discussion

Tuberculosis affects people in large number and involves mainly people of low socioeconomic status. Tb has intimidated human race since time immemorial and continues to pose a social and economic catastrophe. A vicious cycle of malnutrition and disease.<sup>[3]</sup> Undernutrition can lead to progression of latent infection to TB. TB worsens undernutrition, which in turn increases the severity of TB disease.<sup>[4]</sup> TB is a disease classically associated with wasting, which can easily be assessed by measuring MID UPPER ARM CIRCUMFERENCE. MID UPPER ARM CIRCUMFERENCE reflects nutrition status of the patient. Wasting in TB is due to 3 mechanisms. First is decreased intake because of anorexia and its severity of clinical disease, second TB increases the basal metabolic rate because of fever, although this increase is offset by the decreased energy expenditure due to decreased activity before the clinical improvement starts as a result of treatment.<sup>[5]</sup> Finally, TB causes protein catabolism with a resultant negative nitrogen balance, with muscle breakdown under the influence of the acute phase response. In India TB occurs more often in the poor who are likely to have chronic undernutrition, food insecurity and more likely to encounter delays in initiation of treatment. In such patient TB worsens the already poor nutritional status. Undernutrition impairs cell mediated

immunity which is critical for protection from active TB.<sup>[6]</sup> Linked to a number of adverse outcomes and this deserves greater attention. Undernutrition can impair cell mediated immunity and increase the severity of TB disease. Moderate to severe undernutrition increase the risk of death related to TB and the nutritional status of patient is a stronger predictor of treatment success in patient with drug resistant TB.<sup>[7]</sup>

Undernutrition is also a risk factor for development of drug induced hepatotoxicity, which is a major side effect of anti -TB therapy, and this has documented in a number of studies in India.<sup>[8]</sup>

### Effect of undernutrition on outcomes in TB

Effects on disease – increased severity of disease, increased risk of death.<sup>[9]</sup>

Effects on treatment- delayed sputum conversion, risk factor for drug induced hepatotoxicity, malabsorption of rifampicin, reversion of positive cultures in MDR-TB.<sup>[10]</sup>

Effects on long-term outcomes - increased rate of relapse.<sup>[11]</sup>

Effect on contacts - increased incidence in contacts.<sup>[12]</sup>

## Conclusion

In our study, around 48% of the controls had normal Mid upper arm circumference as compared to 12 % of cases. In cases 52% and 36% of the patients with low MID UPPER ARM CIRCUMFERENCE, have moderate or severe under nutrition respectively as compared to 26% of control each. So, it can be concluded patient with severe or moderate under nutrition had significant higher chance of TB as compared to the patient with normal Mid upper arm circumference.

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