A SHORT REPORT ON THE MID-UPPER ARM CIRCUMFERENCE (MUAC) PATTERN IN CHILDREN IN JOS

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ABSTRACT

Objective: This study was done to report the mid-upper arm circumference (MUAC) pattern in children aged 2-5 years in Jos.

Study Population and Methods: Data was collected in May 2002 and permission was granted for this study to be carried out. Children were selected from both groups of sexes (males and females). A tape measure was used; this is strictly speaking, a Population Study so every child aged five years and below was recruited in this study.

173 pupils (89males and 84females) had MUAC measurements taken.

Results: The Mean (±SEM) MUAC by age distribution:

- 15.8 ± 0.68 cm and 16 ± 0 cm for males and females 2 year old respectively ($p<0.05$);
- 16.5 ± 0.68 cm and 16.4 ± 0.89 cm for males and females 3 year old respectively ($p<0.05$);
- 16.8 ± 0.89cm and 16.7 ± 0.67 cm for males and females 4year old respectively ($p<0.05$);
- 16.3 ± 0.88 cm and 17.4 ± 0.84 cm for males and females 5 year old respectively ($p<0.05$). This shows no significant increase in MUAC measurements with age.

Percentile results in 5 year old males showed a range of 14.5cm (5th percentile) and 18cm (95th percentile), while for females 14.4cm and 17.6cm represented 5th percentile for 3 year olds and 95th percentile for 5 year olds respectively.

Conclusion:

In this study, the mean MUAC values of the age groups varied between 15.8 ± 0.68cm and 17.4 ± 0.84 cm, while 5th to 95th percentile values ranged between 14.4cm to 18cm across both sexes. The lowest mean and percentile values of MUAC for both males and females are higher than 13cm. Therefore an upward review of cut off points for MUAC should be considered in future.

Key words: School children, Mid Upper Arm Circumference (MUAC), Percentiles, Fixed Cut-off points.

INTRODUCTION

Child health is the centre-piece of the health of a nation. It is a fact that the level of body immunity to disease is directly related to the nutritional status of the individual [1, 2]. In considering 'underweight' and 'overweight' (as indexed by measures such as weight-for-length or Arm Circumference), the considerations differ somewhat from those of achieved body size (indexed by length) [3]. Results of anthropometry are commonly and appropriately used as indicative of "nutritional status" [3].

The expert committee on anthropometric reference data for international use, reviewed the use and interpretation of mid upper arm circumference(MUAC) because in the past, low MUAC has been placed at a fixed cut-off point (generally 12.5 or 13.0cm) based on the notion that MUAC is age and sex independent between one and four years of age[4,5].

The use of single measurement such as the triceps skin fold thickness or the mid-upper arm circumference (MUAC) is based on the principle that these measurements, readily reflect the body mass changes and they change very little with age during the interval of 1-5 years of life [6].

The MUAC measurement standard increases by 5.4cm during the first year of life. From 1-6 years, the increase is only 1.5cm. A mid-upper arm measurement of 16.5cm has been considered as a constant standard for children aged 1-6 years and can be used when the precise ages of children are unknown [6].

This study was done to report the MUAC pattern of children in Jos.

SUBJECTS AND METHODS

The study was conducted in St Piran's church school Jos in May 2002.Children in both nursery and primary aged 2-5 years were selected from both groups of sexes (males and females).All the children in each class were recruited. A tape measure was used to measure mid upper arm circumference [7].The site of measurement was fully exposed and the tape measure wrapped round snugly at a level on the arm midway between the acromion and the olecranon process; having flexed the elbow to a right angle. The reading was taken to the nearest 0.1cm twice and the average of the two readings recorded as the final reading [8].

RESULTS

There were 173 pupils that had their mid-upper arm circumference (MUAC) measurements taken. Out of these 89 were males and 84 females giving a sex ratio (M: F) of 1:0.94.

Results of mean MUAC values for males and females are shown in Table 1, wherein the mean MUAC values (± standard errors of the means SEM) of both males and females are given along with their background weights. The general trend shows a slight increase in mean MUACs with increase in age however, there is an overlap of SEM between 2 and 3 year old males and between 4 and 5 year old males proving that there is no significant difference in MUAC with increase in age (see figure I). The mean weight of the corresponding age groups showed increase in weight as MUAC increased.

Amongst the females the trend was similar. Between age 2 and 3 years MUAC

increased by 0.4cm with no significant difference as shown by SEM values (see Table 1 and Figure II).

In the males, from 2 to 4 years, the MUAC increase is only 1.0cm with a decline of 0.5cm at 5 years. While in the females, from 2 to 5 years the increase was only 1.4cm.

In addition the percentile chart of MUAC in the male category (figure III) shows that the 5th percentile for the 5 year old males has the least value of 14.5cm, while the 95th percentiles of both the 4 and 5 year old males record the highest value of 18cm each.

However in the female category (figure IV) the 5th percentile of the 3 year olds is 14.4cm and the 95th percentile of the 5 year olds is 17.6cm.

Table 1: MUAC of Children aged 2 to 5 years at St Pirans church school, Jos, Nigeria.

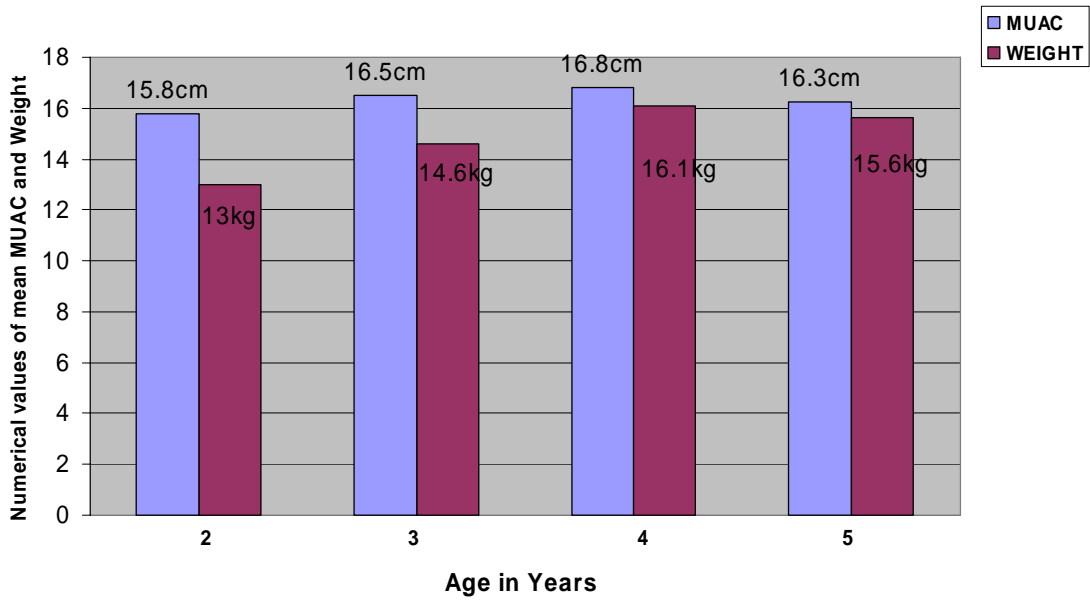|	Mean MUAC in cm ± SEM (Mean Weight in kg ± SEM)	
Age in years	Male	Female
2	15.8 ± 0.68 (13 ± 1.2)	16.0 ± 0 (12.3 ± 1.1)
3	16.5 ± 0.68 (14.6 ± 1.1)	16.4 ± 0.89 (13.8 ± 1.4)
4	16.8 ± 0.89 (16.1 ± 2.13)	16.7 ± 0.67 (15.2 ± 1.25)
5	16.3 ± 0.88 (15.6 ± 1.54)	17.4 ± 0.84 (16.9 ± 1.53)

SEM Standard Error of Mean.

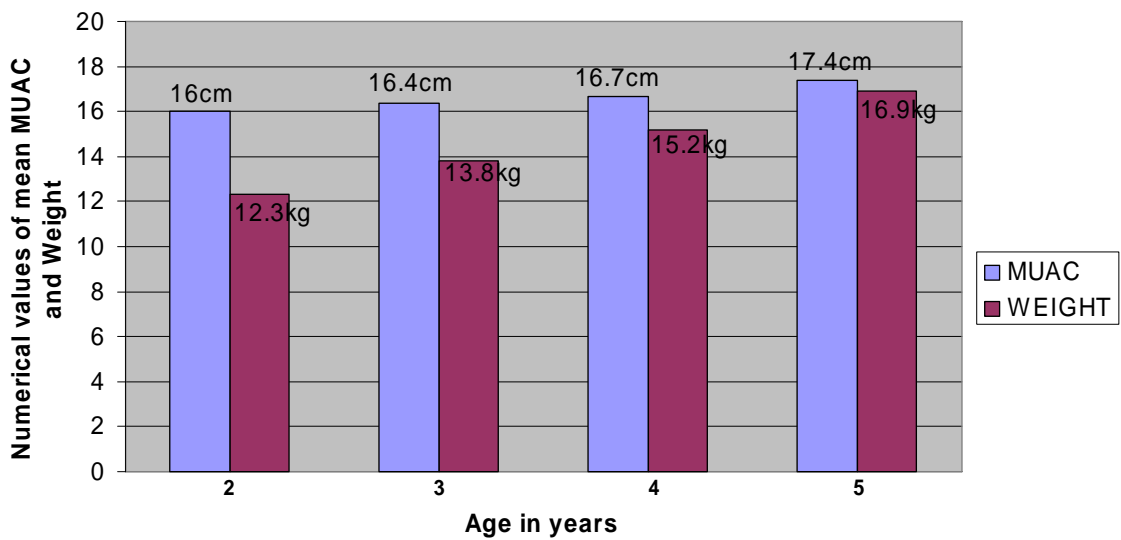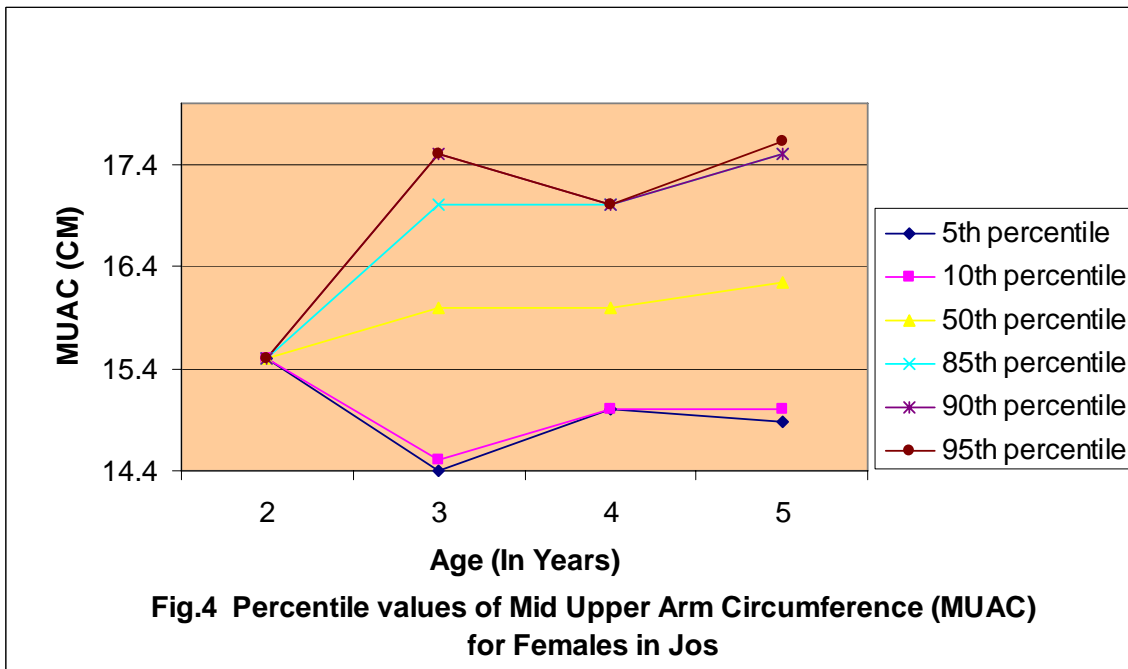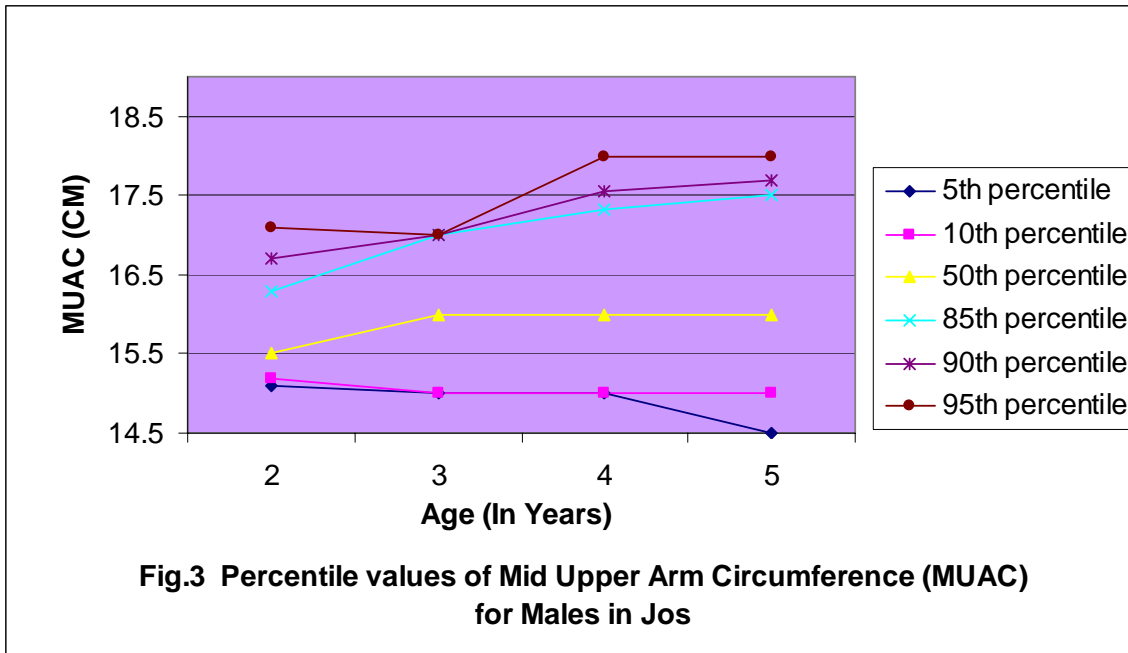**Fig.1 mean MUACs and mean Weight Trends of Males aged 2 to 5 years old.**

Fig.2 mean MUACs and mean weight Trends of Females aged 2 to 5 years old

Fig.3 Percentile values of Mid Upper Arm Circumference (MUAC) for Males in Jos

Fig.4 Percentile values of Mid Upper Arm Circumference (MUAC) for Females in Jos

DISCUSSION

Growth assessment is the single measurement that best defines the health and nutritional status of children because disturbances in health and nutrition regardless of their aetiology invariably affect child growth. The most commonly used anthropometric indices for assessing child growth are weight -for-height, height – for – age, weight – for -age, and mid upper arm circumference [4].

There is no disputing of the fact that Mean MUAC values across ages show a definite age-dependent increase of approximately 2cm between the ages of 6 and 59 months in both affluent and non-affluent populations [5];

therefore the assumption of age independence should be handled with caution because such an argument does not reflect the true pattern of mid-upper arm growth, and so the use of fixed cut-off points of (12.5 to 13 cm), results in wasting being over-diagnosed among younger children and under-diagnosed among older ones. It is already a known fact that younger children are more likely to have low MUACs and have higher mortality rates as a result of infectious diseases and the like. MUAC is said to predict childhood mortality better than height- and weight-age-adjusted indicators in community-based studies[5].

Analysis carried out in preparation for the Expert Committee showed that this superior performance of the MUAC declined significantly after adjustment for age. In fact, the ability of the MUAC to predict mortality was comparable with that of age, height, or weight, based on fixed cut-offs (unadjusted for age) [5].

However in this study, the MUAC values of all the age groups are above 13cm. Therefore any MUAC value below 14.4cm in 2 to 5 year old males and females should be a cause for concern because it is an early indication of malnutrition. Therefore, an upward review of the cut off points for MUAC is necessary.

It should be noted that amongst the different age groups across both sexes, the MUAC did not show any significant difference.

It is also important to note that the children in this study are healthy and generally from average/above average Nigerian families. These figures suggest that a review in the cut off points for MUAC in assessing malnutrition in our children requires consideration.

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