

## REVIEW ARTICLE

### A COMPARATIVE STUDY TO ASSESS THE MALNUTRITION AMONG ADULT WOMEN BY USING MID UPPER ARM CIRCUMFERENCE (MUAC) VERSUS BODY MASS INDEX (BMI) AT THIRUBHUVANAIPALAYAM, PUDUCHERRY

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#### ABSTRACT

Malnutrition, defined as ill health caused by deficiencies of calories, protein, vitamins, and minerals interacting with infections and other poor health and social conditions, saps the strength and well-being of millions of women and adolescent girls around the world. though malnutrition actually also relates to problems of nutritional excess. **Objectives:** To assess the level of malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) versus Body Mass Index (BMI), To correlate the mid upper arm circumference (MUAC) and Body Mass Index (BMI) among adult women, To associate the level of malnutrition among adult women with their selected demographic variables. **Research Methodology:** A comparative descriptive design and quantitative research approach was adopted. 100 samples who are all adult women was selected for the study by using purposive sampling technique and the study was done at SMVMCH by using MUAC and BMI score. **Result:** Frequency and Percentage wise Distribution of nutritional Variables among adult women's. Out of the 100 adult women's who were interviewed, Majority of the adult women's 98 (98%) of study population were no decreased in food intake in declined food intake over the past 3 month. Most of the adult women's 95 (95%) were no weight loss in during last 3 month. Majority of the adult women's 92 (92%) were independently do the routine. Most of them, were not experienced in having any chewing (or) swallowing difficulty 99 (99%). Majority of the adult women's are followed any prescribed drug 97 (97%). Majority of the adult women's 36 (36%) were not experienced eating fruits and vegetables. Majority of the adult women's were weekly consuming meat, chicken and fish 96 (96%). Most of them, 2 to 3 liter fluid consumed per day 82 (82%). Majority of them 212 (53%) were in View self as being no nutritional problem 87 (87%). Most of the adult women's 97 (97%) were experienced in having any psychological disturbance 99 (99%). Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC). Majority of the adult women 28 (28%) had normal and obese level of malnutrition, 21 (21%) had more obese level of malnutrition, 13 (13%) had over weight level of malnutrition and less number had under- weight level of malnutrition 10 (10%). Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Body Mass Index (BMI) - ASIAN CRITERIA. Majority of the adult women 32 (32%) had pre- obese level of malnutrition, 24 (24%) had normal weight level of malnutrition, 19 (19%) had obese level of malnutrition, 17 (17%) had over weight level of malnutrition and less number had under- weight level of malnutrition 8 (8%). Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Body Mass Index (BMI) - WHO CRITERIA. Majority of the adult women 39 (39%) had normal weight level of malnutrition, 31 (31%) had pre-obese level of malnutrition, 16 (16%) had obese- I level of malnutrition, 8 (8%) had under- weight level of malnutrition and less number 4 (4%) had over weight level of malnutrition. **Conclusion:** A study to assess the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI) at Thirubhuvanai Palayam. The findings of the study revealed that out of 100 adult women, the level of the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC), Body Mass Index (BMI) - ASIAN criteria and Body Mass Index (BMI) - WHO criteria in 28 (28%) had normal and obese level of malnutrition, 32 (32%) had pre- obese level of malnutrition and 39 (39%) had normal weight level of malnutrition.

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## INTRODUCTION

Malnutrition, defined as ill health caused by deficiencies of calories, protein, vitamins, and minerals interacting with infections and other poor health and social conditions, saps the strength and well-being of millions of women and adolescent girls around the world. [In this brief, the term malnutrition will

refer to conditions of nutritional deficiency, including under nutrition and micronutrient deficiencies, though malnutrition actually also relates to problems of nutritional excess. Although malnutrition's effects on this group have been recognized for decades, there has been little measurable progress in addressing the specific nutritional problems of women and adolescent girls. Ignorance about the symptoms of malnutrition, such as the lethargy and depression caused by iron deficiency, may be dismissed as "normal" or unimportant, further exacerbating the problem.

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## Need for the study

**In worldwide:** There were 815 million undernourished people in the world in 2017 (11% of the total population). This is a reduction of 176 million people since 1990 when 23% were undernourished. In 2012 it was estimated that another billion people had a lack of vitamins and minerals. In 2015, protein-energy malnutrition was estimated to have resulted in 323,000 deaths—down from 510,000 deaths in 1990. Other nutritional deficiencies, which include iodine deficiency and iron deficiency anemia, result in another 83,000 deaths. In 2010, malnutrition was the cause of 1.4% of all disability adjusted life years. About a third of deaths in children are believed to be due to under nutrition, although the deaths are rarely labeled as such. In 2010, it was estimated to have contributed to about 1.5 million deaths in women and children, though some estimate the number may be greater than 3 million. An additional 165 million children were estimated to have stunted growth from malnutrition in 2013. Under nutrition is more common in developing countries. Certain groups have higher rates of under nutrition, including women—in particular while pregnant or breastfeeding—children under five years of age, and the elderly. In the elderly, under nutrition becomes more common due to physical, psychological, and social factors.

**In India:** Nutritional status or nutritional health status refers to the state of health of an individual as it is affected by the intake and utilization of nutrients. The main purpose of this nutritional assessment was to find out the facts about nutrition and health status of Nyishi adults of Papumpare district of Arunachal Pradesh, India. The various parameters that were selected to assess nutritional health were socioeconomic status, dietary habit and anthropometric parameters which were implemented with the help of food and health frequency questionnaire and other anthropometric tools. The study also showed that education, occupation as well as family pattern directly affects the food budgeting of the people that ultimately shades impact on health. The anthropometric measurement was done among 100 adults of both sex of the rural and urban area and BMI were calculated. Results showed prevalence of 14% chronic energy deficiency in rural adults whereas it was only 4% in urban. Likewise, 60% people were found to be as normal in rural against 52% in the urban. On the other hand, 14% rural adult found to be normal (optimal) and 26% adult found to be in pre hypertension (normal) against 8% urban adult found to be normal (optimal) and 24% adult found to be in pre hypertension (normal) condition. So, it may be concluded that the results of the epidemiological study with basic comparison of socio-economic, dietary and anthropometric parameters of the adult of same tribe of different conditions with a hope to have further exploration of this topic using other parameters and different age group.

India is one of the nation that is increasingly facing the problem of obesity. According to the recent survey, the state which ranks for obesity are Punjab-30.3 percent males and 37.5 percent females Kerala -24.3 percent males and 34 percent females Goa -20.8 percent males and 27 percent females, Statistical of obesity in India According to anjumalhotra: Obesity affects 5 percent of the country's population. According to the statistics from Urban areas in south India, 21.4 percent of boys and 18.5 percent of girls aged between 13-18 are either overweight or obese.

Moreover 80 percent of overweight children in 10-14 years of age group were at risk of becoming overweight adult. An article in Indian Express in 1997, stated that the incidence of obesity in India is 7.9 percent and comprising mainly of urbanities with this, India would be one of the first nations from the developing countries in Asia to be put on the obesity map. The nutrition foundation of India has just completed a study of the prevalence of obesity in urban Delhi. It may be computed that there are roughly 40-50 million overweight subjects belonging to the upper middle class in the country today. Overweight or obesity may not be considered as a specific disease but it is certainly the mother of important degenerative diseases in adult life.

Other than these, nearly 9000 people die annually just because of obesity. An obese person forgoes a lifespan of 9 years because of obesity. The only reason could be is the unhealthy lifestyle and diet that the modern generation is used to advances in the food industry and the sudden emergence of the packaged food have made the people forget the fresh foods do exist. Children are more prone to get attracted with these foods and their parents Neglects their care. The childhood obesity these will be one of the major reasons for adult obesity. More than half of the world's undernourished people live in India. Tribal groups are among the most underprivileged people in India. They comprise about 8% of the population of India, which probably has the largest number of tribal communities of any country in the world. The Santals are the third largest tribal group in Orissa, with a total population of 629,782 in the districts of Mayurbhanj, Baleswar, and Keonjhar. Their mother tongue is Santali, an Austro-Asiatic language. They traditionally prefer to live in hilly forest clearings, where their main occupation is settled agriculture, followed by gathering of forest produce. The use of anthropometry as an indicator of nutritional and health status of adults is now well established. Body-mass index (BMI; the weight in kilograms divided by the square of the height in meters) is an indicator of overall adiposity, and measures of circumferences are indicators of regional adiposity .

Although adult nutritional status can be evaluated in many ways, the BMI is the most widely used because it is inexpensive, noninvasive and suitable for large-scale surveys. BMI is generally considered a good indicator of not only the nutritional status but also the socioeconomic condition of a population, especially adult populations in developing countries. A BMI less than < 18.5 is widely used as a practical measure of chronic energy deficiency (CED), i.e., a steady condition of underweight in which an individual is in energy balance irrespective of a loss of body weight or body energy stores . Such a steady condition of underweight is likely to be associated with morbidity or other physiological and functional impairments. Another anthropometric measure that can be used to evaluate adult nutritional status is the mid-upper-arm circumference (MUAC). It has been shown that the MUAC is particularly effective for the determination of malnutrition among adults in developing countries. MUAC is a simpler measure than BMI, requiring a minimum of equipment and in practice has now been found to predict morbidity and mortality as accurately as deficits in weight. There are few data on the anthropometric and nutritional status of the tribal populations of India.

**Statement of the problem:** “A Comparative Study to Assess the Malnutrition among Adult Women by Using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI) at Thirubhuvanai Palayam, Puducherry”.

**Objectives:** To assess the level of malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) versus Body Mass Index (BMI).

- To correlate the mid upper arm circumference (MUAC) and Body Mass Index (BMI) among adult women .
- To associate the level of malnutrition among adult women with their selected demographic variables.

### Operational definitions

**Assess:** In this study, it refers to evaluate the level of nutritional status among adult women by using mid upper arm circumference (MUAC) and body mass index.

**Malnutrition:** In this study, it refers the level of nutritional status of the adult women's it includes under nutrition and over nutrition due to improper food habits, health illness, etc.

**Adult women:** In this study, it refers to women age group from 18 – 60 years of adults.

**Mid Upper Arm Circumference:** In this study, it mid upper arm circumference (MUAC) in adult is the circumference of the left upper arm, measured at the mid -point between the tip of the shoulder and the tip of the elbow (olecranon process to the acromion process) by using measuring tape expressed in unit of cm normal nutritional status 21 to 22 cm , <21 cm under nutrition , >22cm obese .

**Body Mass Index:** The Body Mass Index value derived from the Mass (weight) and height of an adult. The BMI is defines as the body mass divided by the square of the body height, and is universally expressed in units of kg /m<sup>2</sup>, resulting from mass in kilograms and height in meters. The normal BMI is 18.5 - 24.9., -if the adult women's BMI is less than 18.5 they are under nutrition, above 30 obese, they are obese .

**Delimitations:** Study is delimited to six weeks period of data collection. The study is delimited to adult womens residing in Thirubhuvanai Palayam.

### Review Of Literature

**E Van Tonderet.al., (2018)** This study aimed to expand on the limited South African malnutrition prevalence data and investigate the feasibility of mid-upper-arm circumference (MUAC) as a malnutrition screening tool .A cross-sectional, multi-centre, descriptive design was adopted .Setting: The study was undertaken in three tertiary public hospitals in the same urban area within the Eastern Cape of South Africa .Adult hospitalised patients volunteered to participate ( $n = 266$ ).Methods: Data were collected using interviewer-administered questionnaires; obtaining anthropometric measurements; and consulting medical files. For maximum accuracy of various MUAC cut-off points, receiver operating characteristic curves were generated and area under the curve determined

Both body mass index (BMI) and MUAC identified 21% of participants as underweight or malnourished, and 39% as overweight or obese. The Malnutrition Universal Screening Tool (MUST) found 23% at increased malnutrition risk. Nurses or doctors detected and referred only 19% of underweight patients ( $BMI < 18.5 \text{ kg/m}^2$ ), to dietetics services. Direct measurements of BMI and MUST were unobtainable in 38% and 43% of patients respectively, whilst MUAC was obtainable in 100%.A statistically significant relationship ( $p < 0.001$ ) exists between MUAC, BMI and MUST to detect malnutrition or malnutrition risk. MUAC cut-offs for under nutrition was determined at <23 cm ( $BMI < 16 \text{ kg/m}^2$ ) and <24 cm ( $BMI < 18.5 \text{ kg/m}^2$ ), respectively, for the study's population groups. Malnutrition prevalence was high in this study, but often unidentified, with only a fifth referred to dietetic services. MUAC is a feasible method to identify adult malnutrition and should be considered as a malnutrition screening tool and key nutritional status indicator in South African public hospitals. Michelle a mendezet.al., (2014).

It is generally believed that overweight is less prevalent than under nutrition in the developing world, particularly in rural areas, and that it is concentrated in higher socioeconomic status (SES) groups. The purpose of this study was to examine patterns of adult female overweight and underweight in the developing world by using categories of urban or rural status and SES strata. Body mass index (BMI; in  $\text{kg/m}^2$ ) data collected in 36 countries from 1992 to 2000 by nationally representative cross-sectional surveys of women aged 20–49 y ( $n = 148579$ ) were classified as indicating underweight ( $BMI < 18.5$ ) and overweight ( $BMI \geq 25$ ). Associations between the nutritional status of urban and rural women and each country's per capita gross national income (GNI) and level of urbanization were explored in the overall sample and among different SES groups. Overweight exceeded underweight in well over half of the countries: the median ratio of overweight to underweight was 5.8 in urban and 2.1 in rural areas. Countries with high GNIs and high levels of urbanization had not only high absolute prevalence's of overweight but also small urban-rural differences in overweight and very high ratios of overweight to underweight. In the more-developed countries, overweight among low-SES women was high in both rural (38%) and urban (51%) settings. Even many poor countries, countries in which underweight persists as a significant problem, had fairly high prevalences of rural overweight. In most developing economies, prevalence's of overweight in young women residing in both urban and rural areas are higher than those in underweight women, especially in countries at higher levels of socioeconomic development. Research is needed to assess male and child overweight to understand the dynamics facing these groups as well.

### RESEARCH METHODOLOGY

**Research approach:** Research approach is the basic procedure for conducting the study. A quantitative research approach was adopted for this present study.

**Research design:** Comparative research design was used to achieve the objective and to fulfill the need for the study.

**Setting of the study:** The study was conducted in Thirubhuvanai Palayam at Puducherry. It is located in the Puducherry to villupuram main road.

**Population:** The population for the present study includes Adult women's in Thirubhuvanai Palayam.

**Sample:** The sample of the present study were adult women's who are residing in Thirubhuvanai Palayam.

**Sampling Technique:** Sample who met the criteria during the data collection period was selected using purposive sampling technique.

**Sample Size Calculation:** Sample size consists of 100 adult womens from Thirubhuvanai Palayam

$$n = [DEFF * Np(1-p)] / [d^2 / Z_{1-\alpha/2}^2 * (N-1) + p*(1-p)]$$

**p-** Prevalence

**d-** Relative precision

**DEFF-**Design effect

$$Z_{1-\alpha/2} = 1.96$$

Population size(for finite population correction factor or fpc)(N):69

Hypothesized % frequency of outcome factor in the population (p):81%+/-5

Confidence limits as % of 100(absolute +/- %)(d):5%

Design effect (for cluster surveys-DEFF):1

#### Inclusion Criteria

- Age between 18 to 60 years Adult women's only participate in this study.
- The client who are willing to participate in the study.
- The client who are available at the time of data collection.
- The client who are residing at the Thirubhuvanai Palayam.
- The client who knows Tamil and English.

#### Exclusion Criteria

- The women's below the age group of 18, and above the age group of 60.
- The Women's who are pregnant.

#### Tools and instruments

BMI CLASSIFICATION	NORMALRANGE
Under weight	<18.5
Normal weight	18.5 -24.9
Over weight	>=25.0
Pre obese	25.0 – 29.9
Obese	>=30.0
Obese class –I	30.0 – 40
Obese class –II	40.1 – 50
Obese class –III	>50

**Development of Data Collection Instruments:** The data collection tool consists of 2 sections namely:

Part A: Socio-Demographic Data

Part B: WHO Normal Range of BMI, Asian standards of BMI & MUAC

**Description of Data Collection Instruments: Section A:** This section consists of tool to collect the demographic variable which includes age, religion ,dietary pattern, educational status , family type ,frequency of diet ,marital status ,type of occupation ,personal habits ,regular exercise.

**Section B:**This section consist of WHO normal range of BMI, Asian standards of BMI and MUAC

BMI CLASSIFICATION	NORMALRANGE
Under weight	<18.5
Normal weight	18.5 -22.9
Over weight	23 – 24.9
Pre obese	25.0 – 29.9
Obese	>=30.0
Obese class –I	30.0 – 40
Obese class –II	40.1 – 50
Obese class –III	>50

#### Who criteria bmi cut- off food and nutrition technical assistance muac cut-off

CATEGORY	MUAC CUT –OFF
Under weight	22 -23CM
Normal	24-25CM
Over weight	26-27CM
Obese	28-30CM
More obese	MORE THAN 30CM

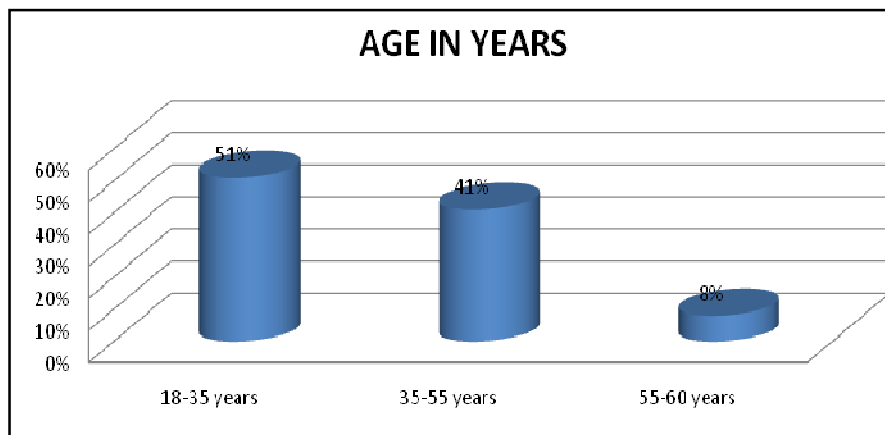
**Validity:** Validity is the essential characteristics of the entities, procedures or devices actually done to measure the dimensions that they mean to measure. The contents of the tool were evaluated by five experts from Community health Nursing Department of various institutions. The suggestions given by the experts were incorporated and the tool was finalized.

**Pilot study:** The Pilot study is a preliminary research conducted to test the elements of design before the commencement of an actual full scale study. It is a small version or a trial run of the major study. The setting selected for the pilot study was Thirubhuvanai Palayam rural area at Puducherry. The Pilot study was conducted from 2<sup>nd</sup> – 5<sup>th</sup> January 2019. The researcher selected 10adult women's in Thirubhuvanai Palayam rural area at Puducherry.

The samples taken were excluded for the 10 main study. After getting the consent from eachadultwoman, data collection was done using the demographic variables and assesses the level of malnutrition using Mid Upper Arm Circumference (MUAC) versus Body Mass Index (BMI) by using WHO and ASIAN criteria. The data was analyzed using descriptive and inferential statistics. Results showed of the levelof the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC). Majority of the adult women(45%) had normal and obese level of malnutrition, (18%) had more obese level of malnutrition, (22%) had over weight level of malnutrition and less number had under- weight level of malnutrition (20%),level of the malnutrition among adult women by using Body Mass Index (BMI) - ASIAN CRITERIA. Majority of the adult women(38%) had pre- obese level of malnutrition, (22%) had normal weight level of malnutrition, (13%) had obese level of malnutrition, (17%) had over weight level of malnutrition and less number had under- weight level of malnutrition (10%).

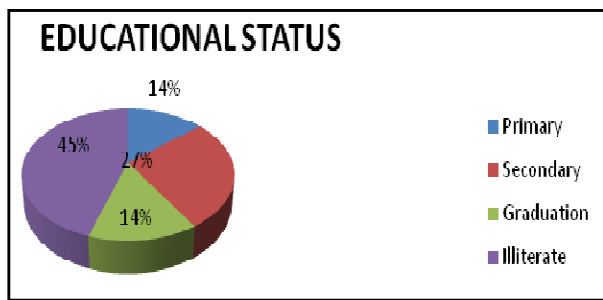
**Analysis And Interpretation Of Data**

DEMOGRAPHIC VARIABLES	FREQUENCY	PERCENTAGE
Age (in years)		
• 18-35 years	51	51
• 35-55 years	41	41
• 55-60 years	8	8
Religion		
• Hindu	97	97
• Muslim	2	2
• Christian	1	1
Dietary pattern		
• Vegetarian	0	0
• Non- vegetarian	100	100
Educational status		
• Primary	14	14
• Secondary	27	27
• Graduation	14	14
• Illiterate	45	45
Family type		
• Nuclear family	66	66
• Joint family	34	34
Frequency of diet		
• 1 time	2	2
• 2 times	3	3
• 3 times	89	89
• Above 3 times	6	6
Marital status		
• Married	83	83
• Unmarried	8	8
• Divorced/widow	1	1
• Widows	8	8
Occupation		
• Government	4	4
• Private	7	7
• House wife	88	88
• Coolie	1	1
Life style characteristics		
• Using tobacco substance	0	0
• Betel chewing	6	6
• Coffee, tea	6	6
• Others	8	8
• None	80	80
Do regular exercise		
• Yes	6	6
• No	94	94



And the level of the malnutrition among adult women by using Body Mass Index (BMI) - WHO CRITERIA. Majority of the adult women(45%) had normal weight level of malnutrition, (30%) had pre-obese level of malnutrition,(15%) had obese- I level of malnutrition, (10%) had under- weight level of

malnutrition. Findings were suggestive that there is efficacy of MUAC and BMI to assess the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI) at selected rural area. The study was found to be feasible with regard to time, the availability and the



co-cooperativeness of samples. It also provided information regarding feasibility and practicability of the designed methodology.

**Discussion, summary, conclusion, nursing implications and recommendations:** The present study was attempted to a comparative study to assess the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI) at Thirubhuvanai Palayam.

This study was conducted to assess the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI) at Thirubhuvanai Palayam. Comparative research design was conducted among 100 adult women at Thirubhuvanai Palayam, Puducherry. The nature and purpose of the study was explained in adult women, consent was obtained from the subjects. Each adult women was selected through purposive sampling method and demographic variables and the WHO normal range of BMI and MUAC were used to assess the level of malnutrition among adult women.

The data collection was done from 1<sup>th</sup> – 31<sup>st</sup> January 2019 from 8am to 4pm. The collected data were computerized and analyzed using Statistical Package for the Social Sciences (SPSS) version 22. The analysis was done using both descriptive and inferential statistics.

**The first objective of the study to assess the level of malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) versus Body Mass Index (BMI):** In this study Table –3 shows Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC). Majority of the adult women 28 (28%) had normal and obese level of malnutrition, 21 (21%) had more obese level of malnutrition, 13 (13%) had over weight level of malnutrition and less number had under- weight level of malnutrition 10 (10%).

**This result was supported by Evan Tonderet.al., (2018)** Andwas aimed to expand on the limited South African malnutrition prevalence data and investigate the feasibility of mid-upper-arm circumference (MUAC) as a malnutrition screening tool .A cross-sectional, multi-center, descriptive design was adopted. The study was undertaken in three tertiary public hospitals in the same urban area within the Eastern Cape of South Africa .Adult hospitalized patients volunteered to participate ( $n = 266$ ). Data were collected using interviewer-administered questionnaires; obtaining anthropometric measurements; and consulting medical files. For maximum accuracy of various MUAC cut-off points, receiver operating characteristic curves were generated and area under the curve determined .Both body mass index (BMI) and MUAC identified 21% of participants as underweight or malnourished,

and 39% as overweight or obese. The Malnutrition Universal Screening Tool (MUST) found 23% at increased malnutrition risk. Nurses or doctors detected and referred only 19% of underweight patients ( $BMI < 18.5 \text{ kg/m}^2$ ), to dietetics services. Direct measurements of BMI and MUST were unobtainable in 38% and 43% of patients respectively; whilst MUAC was obtainable in 100%.A statistically significant relationship ( $p < 0.001$ ) exists between MUAC, BMI and MUST to detect malnutrition or malnutrition risk. MUAC cut-offs for under nutrition were determined at  $< 23 \text{ cm}$  ( $BMI < 16 \text{ kg/m}^2$ ) and  $< 24 \text{ cm}$  ( $BMI < 18.5 \text{ kg/m}^2$ ), respectively, for the study's population groups. Malnutrition prevalence was high in this study, but often unidentified, with only a fifth referred to dietetic services. MUAC is a feasible method to identify adult malnutrition and should be considered as a malnutrition screening tool and key nutritional status indicator in South African public hospitals. In this study Table –4 shows Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Body Mass Index (BMI) - Asian Criteria. Majority of the adult women 32 (32%) had pre- obese level of malnutrition, 24 (24%) had normal weight level of malnutrition, 19 (19%) had obese level of malnutrition, 17 (17%) had over weight level of malnutrition and less number had under- weight level of malnutrition 8 (8%). This result was supported by Luisito O. Llido, MD et.al., (2012) was determine to use for BMI based nutritional status "Asian" criteria – for nutrition screening of hospitalized patients in the Philippines.

BMI was computed and population distribution determined using "Asian" criteria. The collected values were plotted to form graphs using Microsoft Excel. The criteria which produced the "normal distribution" pattern was considered the most appropriate criteria.140,612 patients from Phase 1 and 53,431 from Phase 2 were gathered with a male to female ratio of 1:1.5. From the Weight Centre 584 patients were included. Distribution was not similar in Phase 1: Normal BMI (Asian=31.3%), Overweight BMI (Asian=18.7%), and in Pre-Obese BMI (Asian=31.9%). Phase 2 result was similar. The Asian criteria showed a bimodal pattern with two peaks: the normal and pre-obese groups. In the Weight Centre, the Asian criteria produced less Normal BMI (Asian=5%) and less overweight patients (Asian=7%). In this study Table –5 shows Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Body Mass Index (BMI) - WHO criteria.

Majority of the adult women 39 (39%) had normal weight level of malnutrition, 31 (31%) had pre-obese level of malnutrition, 16 (16%) had obese- I level of malnutrition, 8 (8%) had underweight level of malnutrition and less number 4 (4%) had over weight level of malnutrition. This result was supported by Luisito O. Llido, MD et.al., (2012) The WHO criteria for nutritional status determination using the Body Mass Index (BMI) has been the standard used in nutrition screening and assessment. To determine which criteria to use for BMI based nutritional status – WHO (World Health Organization) for nutrition screening of hospitalized patients in the Philippines. Height in meters and weight in kilograms from two time periods were gathered with data from the Weight Centre for comparison.140,612 patients from Phase 1 and 53,431 from Phase 2 were gathered with a male to female ratio of 1:1.5. From the Weight Centre 584 patients were included. Normal BMI WHO=50% Overweight BMI WHO=31.7% The WHO

criteria produced the normal “inverted bell” pattern. In the Weight Centre, the Asian criteria produced less Normal BMI WHO=11.8% and less overweight patients WHO=27%) with a flattened initial curve in contrast to the WHO pattern. The WHO based BMI classification of nutritional status reflected the “normal” distribution pattern.

**The second objective of the study to correlate the mid upper arm circumference (MUAC) and Body Mass Index (BMI) among adult women:** In this study Table -7 shows Correlation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) - ASIAN criteria among adult women. In mean and standard deviation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) - ASIAN criteria among adult women is 27.25 ±3.682 and 25.55 ±4.888, Correlation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) - ASIAN criteria among adult women indicates the positive correlation and shows the results r- value is (.847) p-value is (p=.001) are highly significant. This result was supported by Nestor Benítez Brito et al., (2015) that Nutritional screening is a fundamental aspect of the initial evaluation of the hospitalised patient. Analyse the relationship between BMI and Mid-Upper Arm Circumference (MUAC); 2) establish a cut-off point of MUAC equivalent to BMI <18.5 kg/m<sup>2</sup>. The anthropometric data of patients hospitalised over the period 2004–2013 were retrospectively revised. The following variables were collected: weight, height, BMI, MUAC, sex and age. 1373 patients were evaluated, who presented a mean weight of: 65.04±15.51 kg; height: 1.66±0.09 m; BMI: 23.48±5.03 kg/m<sup>2</sup>; MUAC: 26.95±4.50 cm; age: 56.24±16.77. MUAC correlates suitably to BMI by means of the following equation (simple linear regression): BMI = -0.042 + 0.873 x MUAC (cm) (R<sup>2</sup> = 0.609), with a Pearson r value of 0.78 (p<0.001).

The area under the curve of MUAC for the diagnosis of malnutrition was 0.92 (95% CI: 0.90–0.94; p<0.001). The MUAC value ≤22.5 cm presented a sensitivity of 67.7%, specificity of 94.5%, and a correct classification of 90%. No significant statistical differences were found in the cut-off point of MUAC for the diagnosis of malnutrition based on sex (p = 0.115) and age (p = 0.694). MUAC correlates positively and significantly with BMI. 2) MUAC ≤ 22.5 cm correlates properly with a BMI of <18.5 kg/m<sup>2</sup>, independent of the age or sex of the patient, although there are other alternatives. In this study Table -8 shows Correlation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) - WHO criteria among adult women. In mean and standard deviation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) - WHO criteria among adult women is 27.25 ±3.682 and 29.17 ±3.677, Correlation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) - WHO criteria among adult women indicates the positive correlation and shows the results r- value is (.162) p-value is (p=.107) are not significant.

**The third objective of the study to associate the level of malnutrition among adult women with their selected demographic variables:** In this study Table 9 shows that the demographic variable educational status and life style characteristics had shown statistically significant association of the level of malnutrition MUAC among adult women with chi-square value of ( $\chi^2=17.54$ , d.f=12) and ( $\chi^2=15.94$ , d.f=12) at p<0.001 level.

The level of malnutrition MUAC among adult women, demographic variable Educational status and life style characteristics are highly statistically significant association, most of them had illiterate and none in the life style characteristics. The demographic variable frequency of diet characteristics had shown statistically significant association of the level of malnutrition MUAC among adult women with chi-square value of ( $\chi^2=14.57$ , df=12) at p<0.005 level. The level of malnutrition MUAC among adult women, demographic variable frequency of diet characteristics are statistically significant association, most of them had 3 times in frequency of diet. In this study Table 10 shows that the demographic variable educational status and family type had shown statistically significant association of the level of malnutrition BMI among adult women with chi-square value of ( $\chi^2=26.36$ , d.f=12) and ( $\chi^2=18.45$ , d.f=4) at p<0.001 level.

The level of malnutrition BMI among adult women, demographic variable educational status and family type are highly statistically significant association, most of them had illiterate and nuclear family. The demographic variable life style characteristics had shown statistically significant association of the level of malnutrition BMI among adult women with chi-square value of ( $\chi^2=20.46$ , d.f=12) at p<0.005 level. The level of malnutrition BMI among adult women, demographic variable life style characteristics are statistically significant association, most of them had none in the life style characteristics.

## Summary

The present study was conducted to assess the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI) at Thirubhuvanai Palayam. Comparative research design was conducted among 100 adult women at Thirubhuvanai Palayam, Puducherry. The nature and purpose of the study was explained in adult women, consent was obtained from the subjects. Each adult woman was selected through purposive sampling method and demographic variables and the WHO normal range of BMI and MUAC were used to assess the level of malnutrition among adult women. The level of the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC). Majority of the adult women 28 (28%) had normal and obese level of malnutrition. The level of the malnutrition among adult women by using Body Mass Index (BMI) - ASIAN criteria. Majority of the adult women 32 (32%) had pre- obese level of malnutrition. The level of the malnutrition among adult women by using Body Mass Index (BMI) - WHO criteria. Majority of the adult women 39 (39%) had normal weight level of malnutrition.

## Major findings in the study

•Table 1: Frequency and Percentage wise Distribution of Demographic Variables among adult women's. Out of the 100 adult women's who were interviewed, Majority of the adult women's 51 (51%) of study population were in the age group between 18-35 years. Most of the adult women's 97 (97%) were Hindus. All the adult women's 100 (100) were non-vegetarian. Most of them, were comes under illiterate 45 (45%) in educational status. Majority of the adult women's are nuclear family 66 (66%). Majority of the adult women's 89 (89%) were 3 times in frequency of diet. Majority of the adult

women's were married 83 (83%) Most of them, house wife in occupation status 88 (88%). Majority of them 212 (53%) were not experienced in Life style characteristics 80 (80%). Most of the adult women's 97 (97%) were not experienced in regular exercise 94 (94%).

•Table 2: Frequency and Percentage wise Distribution of nutritional Variables among adult women's. Out of the 100 adult women's who were interviewed, Majority of the adult women's 98 (98%) of study population were no decreased in food intake in declined food intake over the past 3 month. Most of the adult women's 95 (95%) were no weight loss in during last 3 month. Majority of the adult women's 92 (92%) were independently do the routine .Most of them, were not experienced in having any chewing (or) swallowing difficulty 99 (99%). Majority of the adult women's are followed any prescribed drug 97 (97%). Majority of the adult women's 36 (36%) were not experienced eating fruits and vegetables. Majority of the adult women's were weekly consuming meat, chicken and fish 96 (96%). Most of them, 2 to 3 liter fluid consumed per day 82 (82%). Majority of them 212 (53%) were in View self as being no nutritional problem 87 (87%). Most of the adult women's 97 (97%) were experienced in having any psychological disturbance 99 (99%).

•Table -3: Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC). Majority of the adult women 28 (28%) had normal and obese level of malnutrition, 21 (21%) had more obese level of malnutrition, 13 (13%) had over weight level of malnutrition and less number had under-weight level of malnutrition 10 (10%).

•Table -4: Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Body Mass Index (BMI) - ASIAN CRITERIA. Majority of the adult women 32 (32%) had pre- obese level of malnutrition, 24 (24%) had normal weight level of malnutrition, 19 (19%) had obese level of malnutrition, 17 (17%) had over weight level of malnutrition and less number had under- weight level of malnutrition 8 (8%).

•Table -5: Frequency and percentage wise distribution of the level of the malnutrition among adult women by using Body Mass Index (BMI) - WHO CRITERIA. Majority of the adult women 39 (39%) had normal weight level of malnutrition, 31 (31%) had pre-obese level of malnutrition, 16 (16%) had obese- I level of malnutrition, 8 (8%) had under- weight level of malnutrition and less number 4 (4%) had over weight level of malnutrition.

•The table 6 shows that with respect to Mid Upper Arm Circumference (MUAC). , the mean score was 27.25 ±3.682. With regard to Body Mass Index (BMI) - ASIAN criteria, the mean score was 25.55 ±4.888. With regard to Body Mass Index (BMI) - WHO criteria, the mean score was 29.17 ±3.677.

•Table -7 shows Correlation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) – Asiancriteria among adult women. In mean and standard deviation of the mid upper arm circumference (MUAC) and Body Mass Index (BMI) –Asiancriteria among adult women is

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•The table 9 depicts that the demographic variable educational status and life style characteristics had shown statistically significant association of the level of malnutrition MUAC among adult women with chi-square value of ( $\chi^2=17.54$ , d.f=12) and ( $\chi^2=15.94$ , d.f=12) at p<0.001 level. The demographic variable frequency of diet characteristics had shown statistically significant association of the level of malnutrition MUAC among adult women with chi-square value of ( $\chi^2=14.57$ , d.f=12) at p<0.005 level.

•The table 10 depicts that the demographic variable educational status and family type had shown statistically significant association of the level of malnutrition BMI among adult women with chi-square value of ( $\chi^2=26.36$ , d.f=12) and ( $\chi^2=18.45$ , d.f=4) at p<0.001 level. The demographic variable life style characteristics had shown statistically significant association of the level of malnutrition BMI among adult women with chi-square value of ( $\chi^2=20.46$ , d.f=12) at p<0.005 level.

## Conclusion

A study to assess the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI) at Thirubhuvanai Palayam. The findings of the study revealed that out of 100 adult women, the level of the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC), Body Mass Index (BMI) - ASIAN criteria and Body Mass Index (BMI) - WHO criteria in 28 (28%) had normal and obese level of malnutrition, 32 (32%) had pre- obese level of malnutrition and 39 (39%) had normal weight level of malnutrition.

**Implications of nursing research”** The findings of the study have implications in different branches of nursing that is in nursing practice, nursing education, nursing administration and nursing research, the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI). The investigator received a clear picture regarding the different steps to be taken in different fields to improve the same.

**Nursing practice:** Educating and creating awareness is an integral part of the nursing service. Based on the finding of this study, community Nurses as a counsellor should provide



adequate guidance and knowledge about malnutrition among adult women. Nurses working in community area should have enough knowledge and special skills to identify the malnutrition using the Mid Upper Arm Circumference (MUAC) and Body Mass Index (BMI) among adult women.

**Nursing education:** Being a nursing educator, the community health nursing, curriculum needs to strengthen in order to enable the nursing students to learn about full aspects of malnutrition among adult women. Nurse educators when planning and instructing nursing students, shall provide opportunities for students to gain skill in explaining Mid Upper Arm Circumference (MUAC) and Body Mass Index (BMI) and its importance. so that future nurses will be trained to identify the malnutrition. The nursing students need to organize many workshops, in - service education program to nurses, students and for the adult women regarding malnutrition and obesity and its importance in various settings and in various aspects.

**Nursing administration:** The nurse as an administrator can improve the health conditions of the adult women. The community nursing officer as a health administrator must plan, organize, supervise, and evaluate the various awareness program related to adult women. The nurse administrator should take active part in the policy making, developing protocol, standing orders related health care measures. The findings of the study can help the nurse administrator to formulate policies for care of mal nutrition and obesity among adult women and implication in hospital side.

**Nursing Research:** There is a need for intensive and extensive research in this area. It opens a big avenue for research on innovative methods of creating awareness, development of teaching material and setting up multimedia centers for teaching and for creating awareness among adult women regarding malnutrition. This study will motivate other investigators to conduct future studies the malnutrition among adult women by using Mid Upper Arm Circumference (MUAC) Versus Body Mass Index (BMI).

### Recommendations

- To implementing measuring height, weight, calculating BMI and MUAC appropriate primary care visits.
- For adults women's who are overweight or obese, recommend that refer to structured behavioural interventions, aimed at weight loss.
- Counseling services to often unidentified and untreated for malnutrition, with only a being referred to dietetic services.
- Health education regarding malnutrition, obesity and healthy diet among adult women's.
- Further research is recommended to validate the proposed MUAC and BMI cut-offs in hospitalized patients, but also to extend it to other settings.
- A similar study shall be conducted among the adult women's in large scales under different study settings.
- Research on larger samples of The Indian populations are needed, to develop MUAC and BMI cut-offs for these groups.
- Conduct the same study in various age groups.
- To conduct awareness programme to health care professional regarding malnutrition.

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