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ROLE OF ANTHROPOMETRIC INDICES IN ASSESSMENT OF OBESITY AND THEIR IMPORTANCE IN DETECTING CARDIAC ABNORMALITIES

Dr. K. B. Kishore Mohan[1], Gajapathy. B[2], SivaBharathi. G[3]
[1]Department of Biomedical Engineering
Saveetha Engineering College
kishorekbmtech@yahoo.co.in
[2]Department of Biomedical Engineering
Saveetha Engineering College
gajapathyb1333@gmail.com
[3]Department of Biomedical Engineering
Saveetha Engineering College
gkss12693@gmail.com

Abstract
To give the anthropometric indices of a people who undergoes obesity, these anthropometric indices include head circumference, neck circumference, waist circumference. With these parameters and measurements, we can find the correlational analysis and statistics of those peoples. Those who undergo obesity will face some physical struggles in their regular tasks. Due to these obese indices, many cardiac abnormalities may occur. Early detection will help from these cardiac issues and reduce long term damage. The suggested approach will used to construct a stability analysis based anthropometric indices. These measurements can also be used to determine body composition in adults to help determine underlying nutritional status and diagnose obesity. The core elements of anthropometry are height, weight, head circumference, body mass index (BMI), body circumferences to assess for adiposity (waist, hip, and limbs), and skinfold thickness. Obesity is associated with hypertension and diabetes mellitus (DM), increasing cardiovascular disease risk and mortality. While body mass index (BMI) is widely used to measure obesity, it has several limitations. Therefore, alternative anthropometric indices such as Head circumference (HC), Neck circumference (NC), Waist circumference (WC) have been suggested
Keywords--- Anthropometric Indices, cardiac abnormalities, obesity.

I. INTRODUCTION

OBESITY

Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A body mass index (BMI) over 25 is considered overweight, and over 30 is obese. It is essential to make sure, which anthropometric measurements of obesity, general or central, is better predictors of cardiovascular disease (CVD) risk in women. Increase in CVD risk associated with 1 SD increment in each anthropometric measurement above the mean was calculated, and the diagnostic efficacy of obesity gauges in detecting participants with increased likelihood of being above the treatment threshold was measured. We thrive to ascertain the associations between general and central obesity anthropometric measures with CVD risk factors, using a representative sample of south Indian population, who were free from systematic diseases. Obesity has been significantly correlated with an increased risk of type 2 diabetes and cardiovascular disease, as well as other conditions such as cancer and other morbid ailments, contributing to a decremented quality of life. Taking into account that obesity as a prominent aspect and considering the predominance of obesity worldwide witnesses a noteworthy global public health burden, it is necessary to prevent, detect, and accordingly consider obesity to reduce the future health and economic costs of this problem. 2 The initial approach has been to diagnose individuals within the perspective of obese based abnormalities and the associations with cardiac abnormalities based on significant anthropometric indices. Hence, many anthropometric indices associated with adiposity have emerged, such as the widely known BMI, waist- to-hip ratio (WHR), or percentage body fat (PBF), Neck Circumference, Anthropometric Empirical Indicator (AEI), Chest Circumference, Abdomen Circumference, Hip Circumference, etc...

II. PROBLEM STATEMENT

Overweight and obesity have significant impacts on both physical and psychosocial health with short and long-term adverse effects (Thomas, Wiedemann, Fuemmeler, Martin, Dhurandhar, Bredlau, Heymsfield, Ravussin, & Bouchard,

2014). People who are obese and overweight are more likely to have high-risk factors for heart disease, diabetes, hypertension, and more (Bhattacharya, 2013). Adopting a policy for body mass index (BMI) reporting program, labelling of all foods and beverages to promote consumer awareness of calories, as well as taxes on sugar-sweetened beverages will provide means of reducing the prevalence of obesity and overweight. Obesity in childhood can add up to health problems—often for life. In adults, overweight and obesity are linked to increased risk of heart disease, type 2 diabetes (high blood sugar), high blood pressure, certain cancers, and other chronic conditions. Research has shown that obese children are more likely to be overweight or obese as adults.

Data from the 2005-2006 NHANES survey show that in the United States, nearly 13% of adults age 20 and older have diabetes, but 40% of them have not been diagnosed. Type 2 diabetes (formerly called adult-onset diabetes) accounts for up to 95 percent of all diabetes cases and almost all cases of undiagnosed diabetes. Pre-diabetes, which causes no symptoms, greatly raises the risk of a heart attack or stroke and of developing type 2 diabetes. Though rare in youth ages 12 to 19 years, type 2 diabetes is increasingly being seen in children and adolescents, particularly among minority communities. Moreover, the 2005-2006 NHANES data show that about 16% of these youth have prediabetes. In a recent national study, 58% of children diagnosed with type 2 diabetes were obese.

III. LITERATURE SURVEY

The prevalence of obesity has tripled globally since the 1970s, leading to significant health threats such as cardiovascular disease. In the Eastern Caribbean, where obesity rates are high, central measures like waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR) are better predictors of cardiovascular risk than BMI. This suggests the importance of using WHR alongside BMI for targeting interventions in this population to reduce obesity-related disorders.

The study examined the relationship between anthropometric parameters (weight, height, BMI, and abdominal circumference) and cardiovascular parameters (BP and HR) in Nigerian school-age children. Weight was found to be the most viable predictor of SBP, while age predicted DBP better. Additionally, abdominal circumference emerged as a significant predictor of cardiovascular risk. The study underscores the increasing prevalence of hypertension among Nigerian children and recommends using weight norms for evaluating abnormal SBP levels and age for abnormal DBP levels. This highlights the importance of preventive measures against childhood hypertension in Nigeria.

Obesity is a global epidemic associated with cardiovascular diseases like heart failure, coronary artery disease, and sudden death. It impacts cardiac structure and function, leading to complications such as hypertension and arrhythmias. Weight loss interventions can improve cardiovascular health, but risks like prolonged QTc interval should be monitored. Managing obesity is crucial to reduce healthcare costs and improve overall health outcomes.

This study aimed to assess the anthropometric profiles and prevalence of undernutrition in children with congenital heart disease (CHD). It found that failure to thrive (FTT) was more prevalent than undernutrition, especially in a cyanotic lesion. Weight was more affected than length in a cyanotic CHD, whereas weight and length were equally affected in cyanotic CHD. The study underscores the importance of early detection and management of undernutrition in children with CHD. However, the study did not analyse certain potential risk factors such as family size, income, and presence of congestive heart failure, which could be considered in future research.

Obesity, particularly abdominal obesity, poses significant health risks like cardiovascular diseases and diabetes. Anthropometric health indicators (AHIs), including BMI and waist circumference, help assess these risks. Emerging technologies like 3D scanning systems offer non-invasive alternatives for measuring AHIs. However, current methods still lack universal accuracy and established cutoff points. Further research is needed to refine estimation methods and establish standardized cutoffs for clinical use.

IV. EXISTING METHODS

The currently used method to detect the cardiac abnormalities is head, Neck, waist and chest circumference.

Head Circumference (HC)

Head circumference is measured with a tape measure extending from the middle of the forehead to the farthest part in the rear of the head, as shown in the photo. Measurement should be done using a strong flexible tape measure, though a paper tape measure may be used until an infant has substantial hair.

Fig 1: Head Circumference

Figure 1 shows that how to calculate the head circumference of a baby with a tape extending from middle of the forehead to the rear of the head.

Neck Circumference (NC)

Neck circumference is measured the superior border of the tape measure was placed just below the laryngeal prominence and applied perpendicular to the long axis of the neck. Normal value: In males < 37cms and in females < 34cms.

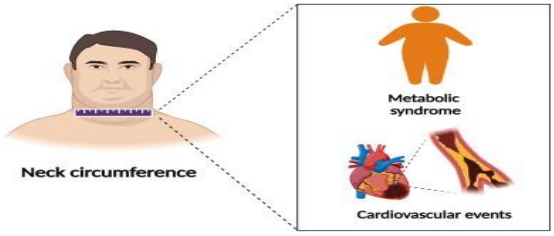

Fig 2: Neck Circumference

Figure 2 shows that neck circumference of an individual and the cardiovascular events involved in it and is measured below the laryngeal prominence and perpendicular to the long axis of the neck.

Waist Circumference (WC)

Waist circumference is measured halfway between the lower ribs and the iliac crest, while hip circumference is measured at the largest circumference around the buttocks.

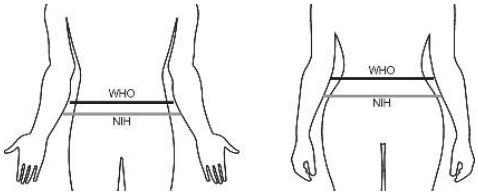

Fig 3: Waist Circumference

Figure 3 shows that calculation of a waist circumference of men and women which is measured between lower ribs and iliac crest and also largest circumference around the buttocks.

Chest Circumference (CC)

Chest circumference, assessed with a tape measure at the level of the nipples, is a difficult serial measurement to achieve with high reliability due to inspiratory and expiratory cycles.

Fig 4: Chest Circumference

Figure 4 shows that measurement of a chest circumference with a tape around the level of nipples.

V. PROPOSED METHOD

We adopted cross-sectional design for this study. A sample of 167 subjects participated in the study from Chennai's urban population. This has been clinically screened to avoid the influence of any systemic disease. After obtaining informed consent, as per the Helsinki declaration, study has been accomplished. The study was approved and ethical clearance was provided by Dean, Saveetha Hospitals and research centre, SIMAT, Chennai, India. All the data were collected during the obesity awareness camp conducted from 15th September 2023 to 17th September 2023 in one stretch.

Height has been gauged using a stadiometer (nearest 0.5 cm) and weight was measured to the proximity of 0.1 kg. Both the above measurements have been taken with the subjects wearing light clothes and no shoes. Hip circumference is the maximum measured circumference at the level of the femoral trochanter. In the same way neck and chest circumferences are measured as per standard technicalities. Indian BMI Standards were used as Standard references for BMI: Normal = 18.5 to 22.9; At Risk = 23 to 24.9; Obese = 25 to 30; over obese ≥30, to allocate the subjects into different groups such as normal, at risk, Obese., abdomen circumference [AC](in cm), hip circumference[HC](in cm), chest circumference[CC] (in cm) and neck circumference[NC] (in cm) were recorded with necessary clinical examination [1, 2, 3, 4].

A slim manager N40 (AIIA communications Inc, South Korea) has been used to calculate Body Mass Index (BMI). Body fat is measured directly for every subject in the optimal operator conditions. Other parameters which were measured by this device: body fat mass (BFM); percent body fat (PBF); weight control (WC); fat control (FC); obesity degree (OD).

The data were evaluated by the SPSS Software Package Version 10.0(SPSS Inching USA). The measured mean values of BMI and Main anthropometric circumferences such as neck, chest, abdomen and hip obtained by descriptive statistics test. The Multivariate analysis was used to find out the correlation between BMI (NC), BMI (CC), BMI (AC),), BMI (HC) and BMI (WHR) in total studied population (male and female studied population). The significance between various parameters was sought by T-test.

VI. RESULTS AND DISCUSSION

Descriptive Statistics, correlational analysis in the form of Scatter plots (BMI vs NECK CIRCUMFERENCE, BMI vs CHEST CIRCUMFERENCE, BMI vs ABDOMEN CIRCUMFERENCE, BMI vs HIP CIRCUMFERENCE, BMI vs WHR).

	BMI	NC	CC	AC	HC	WHR
Mean	25.518	34.531	92.322	86.369	97.447	0.8829
N	167	167	167	167	167	167
Std. deviation	4.6377	5.8851	10.6559	13.7292	7.7606	0.7301
Median	24.900	34.000	92.200	84.400	97.300	0.8700
Minimum	16.3	22.4	9.9	62.3	78.8	72
Maximum	41.8	97.4	118.6	135.4	123.0	1.12

		NC	CC	AC	HC	WHR
BMI	Pearson correlation	0.12	0.324**	0.441**	0.432**	0.925**
BMI	Sig.(2-tailed)	0.11	0.001	0.001	0.001	0.001
BMI	N	167	167	167	167	167

Body mass index (BMI) of anthropometric indices

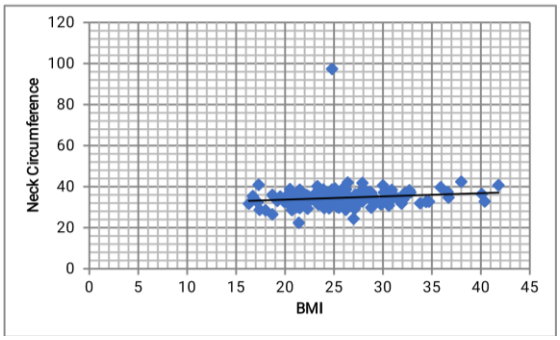

Fig 5: Neck Circumference

Figure 5 shows that the body mass index of the neck circumference.

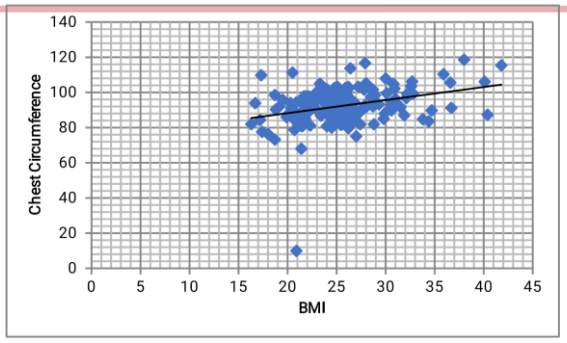

Fig 6: Chest Circumference

Figure 6 show that the body mass index of the chest circumference.

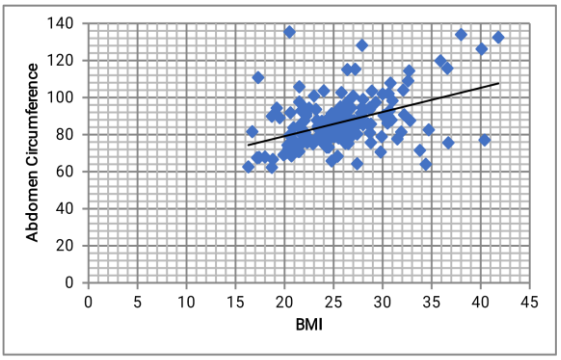

Fig 7: Abdomen Circumference

Figure 7 shows that body mass index of the abdomen circumference.

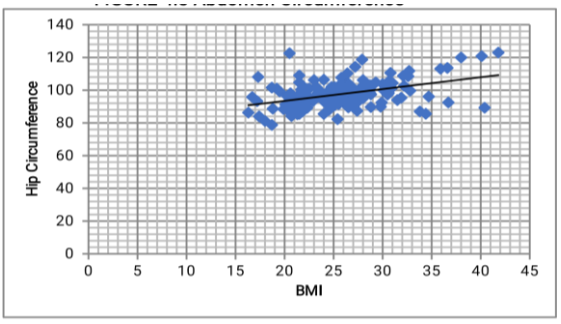

Fig 8: Hip Circumference

Figure 8 shows that the body mass index of the hip circumference.

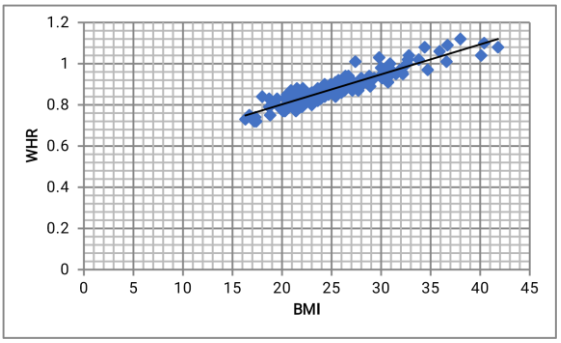

Fig 9: Waist to Hip ratio (WHR)

Figure 9 shows that the body mass index of the waist to hip ratio.

VII. CONCLUSION

Consequently, this study has unveiled the potential for detecting the anthropometric indices and their importance in cardiac abnormalities. These findings indicate that this method is more relevant than other to measure, body mass index (BMI). Therefore, anthropometric measurements can be used to identify nutritional status and also mean, median, standard deviation of these indices. In conclusion, a good or excellent predictive power for obesity was confirmed for the majority of the analysed anthropometric indices. Moreover, the results of this study demonstrated and confirmed the need to change the approach to commonly used indicators such as BMI or WHR in adults, which should lead to the establishment ofnew criteria for the diagnosis of obesity that will also be sex-specific, in the adult population.

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