Short communication

A correlation between height, obesity and intelligence in South Indian medical students

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ABSTRACT

Introduction and Aim: Human intelligence is a cognitive process and was correlated with several anthropometric parameters. Height is one of the well-known factor that is suspected for a positive correlation with intelligence and their association is studied since many years. Similarly, obesity which has become a major health outcome of today is said to have a negative effect on intelligence. Prevalence of obesity and its co-morbidities are in a great rise in both developed and developing countries. Recent findings show that obesity could impair cognitive performance. This study focuses on the correlation of the parameters such as height and BMI (Body Mass Index) with intelligence for selected samples and underscores the significance of correlation. The objective of our study was to test whether a linear relationship exists between the IQ and the two parameters and their strength of correlation.

Materials and Methods: The present study was conducted at Saveetha Medical College and Hospital, Chennai. Sample consists of 50 students of age group 18-20 of phase I MBBS students and the present study was directed in the Department of Anatomy. Intelligence was measured by Standard Progressive Matrices (SPM), a non-verbal reasoning test. Height was measured in metres using stadiometer. Using height and weight values obtained from the sample, Body Mass Index (weight in kg/height in metre squares) was calculated. Mean and Standard Deviation of parameters were assessed and correlation value were calculated.

Results: The data were statistically analysed using correlation and regression. It showed positive correlation between height and intelligence (r=0.268) (p=0.05) and a negative correlation between obesity and intelligence (r=-0.324) (p=0.05).

Conclusion: Therefore, it concludes that height and intelligence were positively correlated, concomitantly obesity and intelligence were negatively correlated mainly due to increase in BMI has a deteriorating effect on intelligence.

Keywords: Anthropometric parameters; correlation; height; obesity; standard progressive matrices; BMI.

INTRODUCTION

-uman knowledge is a psychological cycle and it is the scholarly aptitude of people. LIntelligence quotient (IQ) is an age-related proportion of knowledge level. Since numerous early reports showed that insight associates with various anthropometric factors like height, weight, head periphery, and so on Researchers Paul Broca and Sir Francis Galton were the first to quantify the size of the skull to decide the knowledge. They expected that there could be some relationship between skull size and knowledge. There are numerous ecological and hereditary elements that impacts the human insight. Without a doubt one such pivotal factor is height while searching for the actual premise of relationship with knowledge. Height is the vertical distance estimated from top of the head to lower part of the feet in a human, during erect stance. A person's height is dictated by an intricate interchange among qualities and climate. Essential components influencing height incorporate age, sex, sustenance, actual work, financial status, heritability. Height is additionally critical that it is corresponded with other wellbeing results.

A positive connection among height and insight was accounted for before by number of studies (1). Weight, a strange development of the fat tissue because of a growth of fat cell size (hypertrophic corpulence) or an expansion in fat cell number (hyperplastic heftiness) or a mix of both'. Weight is frequently communicated as far as Body Mass Index (BMI). Obese individuals differ not only in the amount of excess fat that they store, but also in the regional distribution of the fat within the body. Perhaps obesity has become more prevalent form of malnutrition. It is both disease and a major risk that may develop many other morbidities. Incidence of obesity in both developed and developing countries is increasing, affecting children as well as adults. Improper diet pattern, reduced levels of physical activity, sedentary lifestyle and ethnicity are key factors affecting and primarily causing obesity. The World Health Organization (WHO) categorized individuals with BMI equal to or more than 30kg/m2 as obese (obese class I = 30.00-34.99, obese class II=35.00-39.99, obese class III>/=40.00). Obesity has become a major public health concern and is one of the most significant contributors for the cause of several other health problems. Complications of obesity include impaired glucose tolerance and

diabetes mellitus, hypertension, heart disease, dyslipidaemia, cerebrovascular disease, certain types of cancer and other diseases (2).

Increased level of these comorbidities contrasts with each other. Because of the partner sicknesses, weight is additionally prompting an expansion in death rates. Notwithstanding the results including metabolic capacities, cardiovascular framework. а few methodologies, including both epidemiological and testing information have been begun to explore the relationship of corpulence with CNS and tells that heftiness may cause a noxious effect on CNS(3).

The negative relationship of weight with psychological capacity was noticed and BMI over the constraint of extraordinary overweight and corpulence was related with decreased cognitive performance (4, 5). As scholarly capacity of an individual is exceptionally worried at practically altogether areas, this investigation centers around to learn the conceivable connection of insight - height and Intelligence-BMI and underscores the significance of their relationship.

MATERIALS AND METHODS

Sample size and distribution

The present study was conducted (March 2019 to April 2020) at Saveetha Medical College and Hospital, Chennai. Around 50 students of phase I MBBS with 22 males and 28 females were included in this study and the following variables such as IQ, height, weight and BMI were observed and measurement was taking after obtaining proper concern form.

The intelligence was analysed using standard progressive matrices (SPM) - a non-verbal test. It consists of five sets of items within each set, the items become progressively difficult. The raven progressive matrices (RPM) tests measure "general cognitive ability". The best version of the test, known as Standard Progressive Matrices. This test is used in measuring abstract reasoning. Using the test, IQ of the individual samples were obtained. Height was measured using stadiometer, the measurement was taken in standing erect posture without foot wear. Three readings in metres were taken and the mean of those readings was calculated. BMI-body mass index is a commonly used simple index of weight for height that classifies underweight, overweight and obesity in adults. It is calculated by the formula weight in kilograms divided by the square of the height in meter square (kg/m2) (Quetelet's index). BMI is ageindependent and same for both sexes. According to WHO, normal range is 18.50-24.99. BMI of individuals of the sample were calculated using this method with their assessed height and weight measures. The data obtained in the study were statistically analysed using correlation and regression.

RESULTS

In the present study, of 50 students, mean age and intelligence quotient was 18.00 ± 0.4 and 107.46 ± 13.4 respectively. The mean height and body mass index was 165.21 ± 9.39 and 25.384 ± 4.13 respectively (table1).

The Pearson's correlation test was done to correlate height and intelligence quotient and obesity and intelligence quotient.



Fig. 1. The linear relationship (positive correlation) between height and IQ. (r = 0.268, p < 0.05)



Fig. 2: The linear relationship (negative correlation) between BMI and IQ. (r = -0.324, p<0.05)

Table 1: The baseline characters of MBBS students

Parameters	MEAN ± SD
Age	18.00 ± 0.4
Intelligence quotient (SPM)	107.46 ± 13.4
Height (cm)	165.21 ± 9.39
Body Mass Index	25.384 ± 4.13

The values are expressed as mean \pm standard deviation.

Table 2: Pearson correlation coefficient (r) values for	
intelligence with height and BMI respectively	

Parameters	Co-efficient value (r)
Correlation Between	0.268
Height and IQ(SPM)	
Correlation Between BMI	-0.326
and IQ (SPM)	

A positive correlation (r=0.268) was found between height and intelligence quotient and it was statistically significant (p < 0.05). An increase in the height showed an increase in the intelligence quotient, which is expressed (table 2; fig. 1). A negative correlation (r=-0.326) was found between obesity and intelligence quotient. However, the observed correlation was statistically not significant, which is shown (table 2; fig. 2).

DISCUSSION

Height and intelligence, although surely a very different measure, are empirically related (6). Measuring of intelligence started very earlier by scientists like Paul Broca and Galton. They found positive associations between skull size and intelligence. Previously, many researches were conducted to find the relationship between intelligence and physical basis. This study focuses on two parameters height and obesity to know a causal relationship exists between intelligence and the above two factors. There are many studies that were conducted at different populations and have reported the correlation of intelligence between height and obesity (7) in her commentary on height and intelligence reported that there is a positive relationship in their studies. Wheeler et al., in their research showed an evidence on the relationship between height and intellectual impairment concluded that short height had significantly lower intelligence and academic performance(8). The physical basis of precocity and dullness' deduced that taller students performed better academically than did shorter students of the same age (9). Since many studies has established both in developed and developing countries have shown who are shorter or whose linear growth is retarded tend to gain lower scores in tests of cognitive function (10). A Study estimated the genetic correlation between height and general intelligence, results showed the phenotypic correlation between height and general intelligence was 0.16, genetic correlation was 0.28 (11). Similarly, study a conducted in Saudi Arabia showed a significant correlation between height and intelligence (r=0.271) (12). And, in a longitudinal study, there was no significant association between change in relative height and change in IO scores, therefore it is unlike that any formal relationship exists between height and IQ. The positive correlation between height and intelligence could be interpreted cogently by underscoring the standard of nutrition in contribution to growth and development of a child in all aspects which includes both height and brain development also, nutrition being a factor affecting, correlates both. Food insufficiency could also be associated with lower cognitivity among children who are growing phase. And the importance of psychosocial stimulation on cognition. Intellectual ability and abstract thinking of an individual decides his participation in society, so intelligence of a child could probably improve by ensuring provision of sufficient and required nutrition from its intrauterine growth. When bringing to comparison with many previous reports conducted across different nations, in which some showed a positive correlation between height and intelligence. Similarly, in line with previous literature our study was conducted among the South Indian medical students, which showed a positive correlation between height and intelligence.

As per previous literature revealed that obesity in children (BMI>22) was associated with low IQ (13). Obesity is a complex, multifactorial disease that develops from the interaction between genotype and environment, it remains incomplete still how and why obesity occurs, however it involves the multifactorial interaction of social. behavioural, cultural. physiological, metabolic and genetic. Obesity is commonly accompanied by elevated serum triglycerides. Triglycerides rich in lipoproteins may be directly due to atherogenic and most common manifestation of the atherogenic lipoprotein phenotype. In the presence of obesity, high serum triglycerides are commonly associated with some metabolic risk factors known as the metabolic syndrome (atherosclerosis, hypertension, insulin resistance, and glucose intolerance and prothrombic states. Thus, in obese patients, elevated serum triglyceride is biomarker а for increased cardiovascular risk. Obesity as a major health concern not only affects the cardiovascular system, dragging its negative impacts on cognitive performance also A few studies have examined the association between dieting and cognitive function in younger adults, with findings ranging from mild decline to mild improvement⁽¹⁴⁾. Some longitudinal analyses showed higher body composition with more rapid decline on measures of global functioning, executive function and memory over time growing number of studies demonstrating that obesity is an independent factor for poor neuro-cognitive outcome another point to take interest is childhood obesity, which has reached epidemic levels over nations. Overweight and obese in childhood are known to have significant impact on physical and psychological health. Overweight and obesity are assumed to be the results of increased calorie and fat intake with steady decline of physical activity being the major roles in the rising rates of obesity all around the world. Both overconsumption of calories and reduced physical activity are involved in childhood obesity.

A review observed and concluded that obesity causes intellectual impairment, becoming the major health concern, obesity of all age groups, being a major risk factor for both cardiovascular problems and CNS decline, the present research also shows a negative correlation between obesity and IQ (r=-0.326), there is a dire need to initiate prevention and treatment of obesity. It has been hypothesized that a steady decline in physical activity among all age groups has strongly contributed to increasing rate of obesity all around the world (15) educating the obese individuals on weight management, advice to maintain weight and control

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other risk factors, physical activity should be integral part of weight loss therapy and for maintenance. An increase in physical activity is a vital component of weight loss therapy. Most weight loss occurs because of decreased calorie intake, sustained physical activity is found to be most helpful in the prevention of weight regain and for majority of obese population, modification of diet is important for the control. Altogether, prevention and treatment of obesity differs from person to person depending upon the requirement, those measures include education underscoring the control and maintenance, physical therapy, diet therapy and behaviour therapy. Lifestyle modifications with reducing sedentary time must also be encouraged to all age groups mainly to be initiated in young individuals. Although there is growing evidence for the negative correlation between obesity and IQ, some research shows inconsistent effects of obesity on cognitive function in children and adolescents (15). Similarly, this study confirms that there is negative correlation between obesity and intelligence quotient, since the relationship between obesity and cognitive function is much complexed, this area of research requires further studies.

CONCLUSION

Our study shows that psychopathology has solid relationship with obesity of students. This investigation for an enormous scope test has shown that psychopathology certainly affects childhood obesity. These outcomes do not suggest that each hefty students has the presence of psychopathological issues. The current examination infers that height and IQ were decidedly associated which underscores that impact of height as a focal point in knowing the knowledge. Correspondingly there was a negative connection among obesity and IQ. However, cause for the relationship needs further examination.

CONFLICTS OF INTEREST

Authors declare no conflict of interest

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