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Effects of Body Mass Index (B.M.I) on Intelligence Quotient (I.Q)

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ABSTRACT: B.M.I and I.Q, both, are locally and internationally on the rise. A link between the two is likely but which one is influencing the other still remains a mystery. To solve the mystery of correlation between Intelligence quotient (IQ) and Body Mass Index (BMI) and to ascertain whether I.Q has any significant measurable effect on B.M.I, this study is conducted among the students of Liaquat University of Medical and Health Sciences Jamshoro. A structured questionnaire-based cross-sectional study was conducted on 120 students of Liaquat University of Medical & Health Sciences, of both genders, aged between 18-25 years. IQ was recorded using a questionnaire comprising twenty questions, designed on the principle of internationally taken IQ tests; students were advised to solve the test within 10 minutes. For BMI calculation, height and weight measuring machine (RGZ-160) was used; height was measured in m^2 and weight in kg. According to WHO classification of BMI, students were divided into four classes, i.e., class-1 (under weight, BMI <18), class-2 (normal weight, BMI 18-24) and class-3 (over weight BMI ≥25), class-4 (obese BMI ≥30). Data analysis was done on MS excel by applying students *t*-test. Students having average I.Q values of 5.09 and 5 belonged to class-1 (under weight), class-2 (normal weight) respectively, whereas students possessing an I.Q of 6.5 and 7 belonged to class-3 (over weight), class-4 (obese) respectively. IQ of class 3 and 4 students was found significantly higher (P = 0.01) than the class 1 and 2. Students having BMI values >25 had greater I.Q level. The findings can be associated to the life styles and habits of these people.

KEYWORDS: I.Q, Intelligence Quotient, B.M.I, Body Mass Index.

1 INTRODUCTION

Intelligence quotient, according to the oxford dictionary, is a number representing a person's reasoning ability (measured using problem-solving tests) as compared to the statistical norm or average for their age, taken as 100. While Body Mass Index (B.M.I), according to the same source, is an approximate measure of whether someone is over- or underweight, calculated by dividing their weight in kilograms by the square of their height in metres.

Their relationship, unlike their definitions, is not simple and easily understood. Conflicting beliefs exist about the relationship and a variation from place to place and time to time is expected. The uncertainty surrounding this issue stems from the lack of evidence based literature and this study serves the very purpose of filling this gap and helping increase our understanding of the matter.

Overweight and obesity are a global pandemic. According to a WHO report, there are 1 billion overweight people in the world, of whom 300 million are obese **[1]**. Findings of the National Health Survey, Pakistan, 1990–1994, found that the prevalence of obesity for adults from low, middle to high socioeconomic status (SES) was 9%, 15% and 27% for rural areas and 21%, 27% and 42% for urban areas respectively **[2]**. The mechanisms regulating body weight are complex, influenced by diverse factors: physiological, societal, environmental, genetic and behavioral. None of these is completely understood. At the individual level, nutritional, metabolic, hormonal and neuronal signals are integrated within the brain to produce changes in behavior (eating, physical activity) and body metabolism (through the autonomic nervous system and hormonal responses) so as to maintain energy balance **[3]**.

Observations of obesity clustering in families led to an early interest in genetic causes for the condition. About 200 different genes or loci have been linked to obesity in humans **[4]**. However, the pattern of inheritance of obesity suggests

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that the effect is polygenic, with each variant of many different genes making a small difference in effect **[5]**. The rapid increase in the prevalence of overweight and obesity in both developed and developing countries indicates that the trend is largely due to social, environmental and behavioral changes, rather than changes in hereditary factors **[3,6,7]**. Behavioral changes can be attributed to an individual's Intelligence Quotient since people with different I.Q follow different lifestyles and daily routines.

2 METHODOLOGY

A structured questionnaire-based cross-sectional study was conducted on a sample space of 120 students of Liaquat University of Medical & Health Sciences after taking written consent. Students of both genders, aged between 18-25 years were included in the study. IQ was recorded using a questionnaire comprising twenty questions, designed on the principle of internationally taken IQ tests; students were advised to solve the test within 10 minutes. For BMI calculation, height and weight measuring machine (RGZ-160) was used; height was measured in m^2 and weight in kg. According to WHO classification of BMI, students were divided into four classes, i.e., class-1 (under weight, BMI <18), class-2 (normal weight, BMI 18-24) and class-3 (over weight BMI ≥25), class-4 (obese BMI ≥30). Data analysis was done on MS excel by applying students *t*-test.

3 RESULTS

It was observed that students having average I.Q values of 5.09 and 5 belonged to class-1 (under weight), class-2 (normal weight) respectively, whereas students possessing an I.Q of 6.5 and 7 belonged to class-3 (over weight), class-4 (obese) respectively.

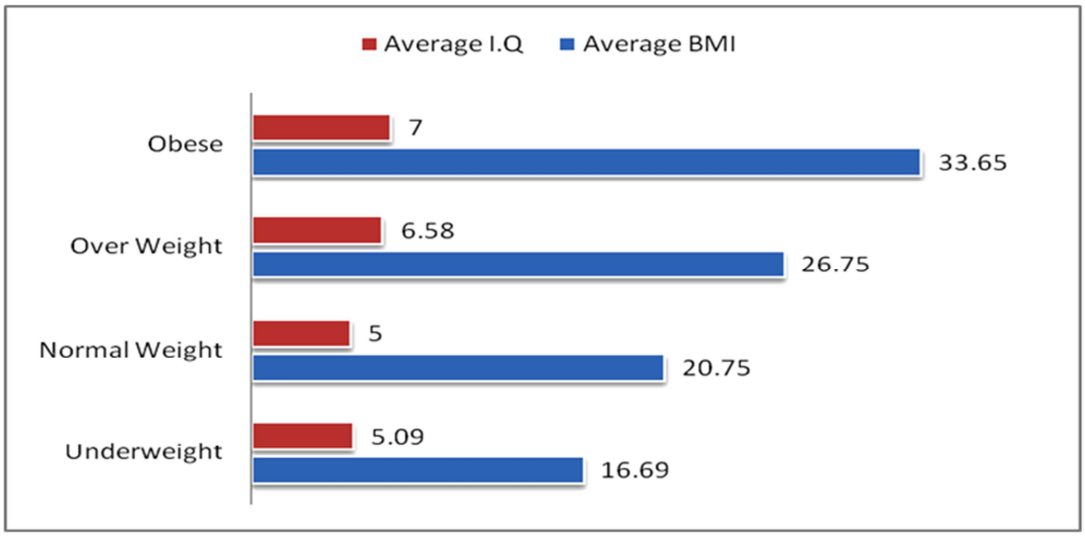

Figure 1 (Y-Axis: Body Mass Index category) (X-Axis: Intelligence Quotient)

The results also showed that a small increase in Intelligence Quotient corresponded with a significant rise in Body Mass Index as is evident in the line graph below.

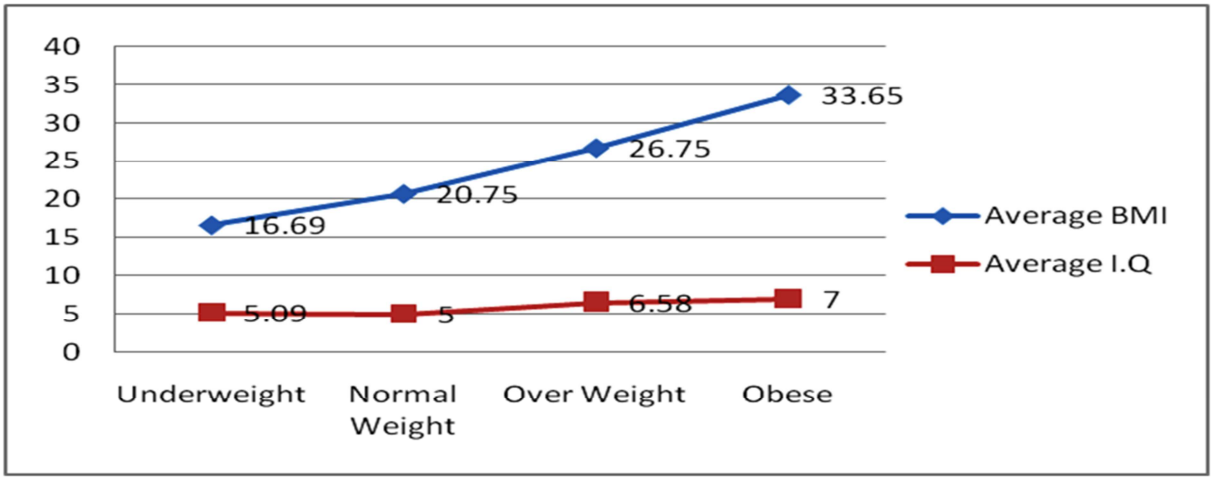

Figure 2 (Y-Axis: Intelligence Quotient) (X-Axis: Body Mass Index Category)

Table 1. IQ of class 3 and 4 students was found significantly higher (P = 0.01) than the class 1 and 2.

Category	Average BMI	St. Deviation BMI	Average I.Q	St. Deviation I.Q
Class 1 Underweight	16.69	1.07	5.09	2.61
Class 2 Normal weight	20.75	1.64	5.00	2.69
Class 3 Overweight	26.75	1.24	6.58	3.06
Class 4 Obese	33.65	3.17	7.00	3.46
T. Test value	0.01			

4 DISCUSSION

Pakistan is a country in transition and now faces double burden of coexistent overnutrition and under nutrition. Obesity is becoming an increasingly prevalent problem in Pakistan, as it has in other developing countries, with under nutrition remaining a problem simultaneously. Such has been observed in comparable developing countries such as Egypt **[8]** and India **[9]**. A recent study demonstrates that a quarter of the population of Pakistan would be classified as overweight or obese with the use of Indo-Asian-specific BMI cutoff values **[10]**. This is significant because the risk of being overweight in adulthood has a positive correlate with being overweight in childhood and adolescence **[11]**. The prevalence of obesity in adolescents in Pakistan is already significant, with one study putting the prevalence of adolescents with a BMI greater than 25 at 18% **[12]**, which is comparable with figures in the West. However, due to our different social and cultural setting, the associations leading towards obesity studied in the West cannot be applied on our population as for example, socioeconomic conditions are directly proportional to overweight as opposed to the Western World **[13], [14]**.

The Intelligence Quotient, like BMI, is also on the rise. The Flynn effect is the substantial and long-sustained increase in both fluid and crystallized intelligence test scores measured in many parts of the world from roughly 1930 to the present day. Test score increases have been continuous and approximately linear from the earliest years of testing to the present. For the Raven's Progressive Matrices test (Raven, John 2000), subjects born over a 100-year period were compared in Des Moines, Iowa, and separately in Dumfries, Scotland. Improvements were remarkably consistent across the whole period, in both countries **[15]**. This effect of an apparent increase in IQ has also been observed in various other parts of the world, though the rates of increase vary **[16]**.

The rise on both fronts led us to analyze B.M.I and I.Q values and find out what association existed between the two. In Pakistani society, the higher socioeconomic class is more likely to be overweight and obese **[13]**. Similarly, the educational status, exposure to more learned environments and familiarity with the test is also expected to be higher than other classes. This makes socioeconomic status an intermediary and/or a bridge, associating with B.M.I and I.Q simultaneously.

The students with greater I.Q, better cognitive ability and higher academic scores generally spend more time studying or indulging in educational activities. The societal pressures, peer competition and the common local belief that educational excellence is more or less directly related to future success in life drives these individuals to take up a largely physically inactive life style. This tends to make these Higher I.Q and better academic performers overweight and obese. This explanation is also valid for the weaker academic performers and lower I.Q individuals who spend less time indoors studying and more outdoors indulging in physical activities and chores.

5 CONCLUSION

Students having greater I.Q values had BMI values >25. The findings can be associated to the life styles and habits of these people. The possibility that better academic performers might have been previously acquainted to the test, resulting in better test score, means that better academic performers too have higher BMI values. This brings to light that our more intellectually able and gifted youth is indulging less in physical activities and likely spending considerably more time indoors resulting in higher weight to square height ratio. Awareness needs to be spread about the adverse health outcomes it can cause and steps need to be taken to preempt any bad outcomes for our youth. More work also needs to be done to further explore the results revealed in this study.

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