ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 9, Issue – 2, March – 2024 , Page No. : 33 – 42

Health status of mentally handicapped attending special school in Central India with special reference to BMI status: A cross sectional study

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Citation this Article: Astha Mishra, Ashok R Jadhao, Kaustubh D Khetre, Kalaivani M, "Health status of mentally handicapped attending special school in Central India with special reference to BMI status: A cross sectional study", IJMSIR - March - 2024, Vol – 9, Issue - 2, P. No. 33 – 42.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Mental handicap is a condition of sub-average intellectual function combined with deficits in adaptive behavior. It affects 2% of India's population. Compared to the general population individuals with Intellectual Disability (ID) engage in less than the recommended amount of physical activity leading to higher body mass index (BMI) that in turn increases the risk of various metabolic disorders. Also they often struggle with nutritional issues, resulting in underweight. Hence this study was undertaken to study the health status of mentally handicapped individuals with special reference to their BMI status and some factors associated with BMI status.

Methods: A cross-sectional study was conducted in Jeevoday Special School, Sadar, and Nagpur between October 2022 to December 2022 among 300 mentally handicapped who were above 5 years of age. Data was collected by face-to-face interview method from teachers and parents regarding sociodemographic details, Intelligence Quotient (IQ), and type of disability among mentally handicapped individuals. Anthropometric measurements of participants were taken and BMI was derived. Data was analyzed using SPSS version 25.

Results: The mean age of participants was 17.77 ± 9.178 years. The majority of participants were ≥ 21 years old, males (64.7%), studying in vocational class (34%), had IDD (57.3%) and mild level of mental retardation (62.7%). The mean BMI was 19.9 ± 5.23, the majority (54.7%) of participants had normal weight, 18% were underweight, 18% overweight and 9.3% obese. BMI status was significantly associated with chronological age, gender and level of mental retardation while chronological age and gender were the significant predictors of BMI.

Conclusions: The majority (54.7%) of participants had normal weight, 18% were underweight, 18% were overweight and 9.3% were obese. Mean and standard deviation of BMI was 19.9 ± 5.23. BMI status was significantly associated with chronological age, gender and level of mental retardation while chronological age and gender were the significant predictors of BMI.

Keywords: mentally handicapped, BMI, obese, autism, cerebral palsy, Intellectual and Developmental Disability (IDD).

Introduction

Handicap may be defined as a "reduction in a person's capacity to fulfill a social role as a consequence of an impairment, inadequate training for the role, or other circumstances". It is a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfillment of a role that is normal (depending on age, sex, and social and cultural practice) for that individual [1].At least 2 percent of India's population is said to be suffering from some kind of mental disability [1].

Mental handicap is the present term used for mental retardation. It is a condition of sub-average intellectual function combined with deficits in adaptive behaviour [1]. Intellectual functioning (such as learning, problem-solving, judgment) is assessed through IQ score combined with clinical judgement [2]. Adaptive functioning (activities of daily life such as communication and independent living) has three areas: conceptual – language, reading, writing, math, reasoning, knowledge, memory; social – empathy, social judgment, communication skills, the ability to follow rules and the ability to make and keep friendships and practical – independence in areas such as personal care, job responsibilities, managing money, recreation, and organizing school and work tasks [2]. Adaptive functioning is assessed through standardized measures with the individual and interviews with others, such as family members, teachers and caregivers [2].

According to ICD-11, disorders of intellectual development are a group of etiologically diverse conditions originating during the developmental period characterized by significantly below-average intellectual functioning and adaptive behavior that are approximately two or more standard deviations below the mean (approximately less than the 2.3rd percentile), based on appropriately normed, individually administered standardized tests. Disorders of Intellectual Development are associated with a high rate of co-occurring mental, behavioral or neurodevelopmental disorders. Some disorders, such as Autism Spectrum Disorder (ASD), depressive disorders, bipolar or related disorders, schizophrenia, dementia, and attention deficit hyperactivity disorder, occur more commonly than in the general population [3].

Intellectual disability affects about 1% of the population of the world, and of those about 85% have mild intellectual disability [3].The overall prevalence of Disorders of Intellectual Development is slightly higher in males [3]. The prevalence of some aetiologies of Disorders of Intellectual Development differs between males and females (e.g., X-linked genetic conditions such as Fragile X Syndrome are predominantly diagnosed in males whereas Turner Syndrome occurs exclusively in females) [3].

Compared to the general population, individuals with intellectual disability (ID) engage in less than the recommended amount of physical activity. The risk of obesity appears to be especially high in women with ID, people with Down syndrome and people with mild ID [4,5]. Being overweight or obese means a higher risk of premature death, cardiovascular disease, high blood pressure, arthrosis, certain kinds of cancer and diabetes (WHO, 2018).

Also, balanced and adequate nutrition is important to improve the quality of life of children with intellectual disability[6]. Most of these children are negatively affected by nutritional problems, failing to develop independent eating habits, presenting stressful behaviors,

eating too much or too little, being extremely selective, rumination, vomiting, pica, taking food secretly between meals, and being obsessed with the temperature or presentation of meals [6]. Disabled children are known to be at high risk for developing malnutrition, which may partly explain the growth retardation often encountered in such children [7].

Hence this study was done with the objective to study the health status of mentally handicapped individuals with special reference to BMI status and some factors associated with BMI status.

Methods

Study design and setting

A cross-sectional study was conducted between October 2022 to December 2022 among 300 mentally handicapped individuals attending Jeevoday Special School, Sadar, Nagpur.

Study population

The study population consisted of mentally handicapped individuals above 5 years of age attending the study institute. Individuals whose parents gave consent for them to participate were included in the study and others were excluded.

Data collection

Written permission from the principal of Jeevoday Special School, Sadar, Nagpur was sought. Data was collected by face-to-face interviewand examination. Parents and teachers were interviewed in person using a predesigned and pre-tested proforma for socio-demographic details, Intelligence Quotient (IQ) and type of disability. Education was classified according to the class in which participants were studying at the time of data collection. Based on their chronological age and IQ level, the mentally handicapped individuals are divided intoclasses as pre-primary, primary I, primary II, primary III, secondary, pre-vocational I, pre-vocational II and vocational. A general and systemic examination of study participants was done. Height was measured on a stadiometer, waist and hip circumference were measured using measuring tape and weight was measured on a digital weighing scale. BMI was calculated by quetelet index, BMI= weight in kg/height in m^2.For participants belonging to age 5-19 years, BMI was classified based on the "WHO suggested set of threshold"according to age and gender which is based on single standard deviation spacing and is classified as thinness/ underweight: <-2SD, overweight: between +1SD and <+2SD and obese: >+2SD. For participants of age ≥ 20 years, BMI was classified based on "WHO classification of BMI" as underweight :< 18.5, normal weight: 18.5-24.9, overweight: 25-29.9and obese: ≥ 30.Waist-to-hip ratio (WHR) was calculated and central obesity was defined according to WHO based on WHR>0.9 for males and >0.85 for females. WHO classification for Mental Retardation (MR) was used to classify mental retardation as- Mild MR: IQ 50-70, Moderate MR: IQ 35-49, Severe MR: IQ 20-34 and Profound MR: IQ <20.

Study variables

BMI/ BMI status were used as dependent variables; chronological age, gender, type of disability and level of MRwere used as independent variables.

Sample size estimation

From a study conducted by Parmar Sanjay et al[8] taken as reference, taking the prevalence of underweight as 76.28% and absolute error as 5%, the sample size estimated was 278.The final sample size was rounded off to 300.

Data analysis

After the collected data were checked for completeness, clarity, and accuracy, it was exported to Statistical Package for Social Sciences (SPSS) version 25 for analysis. The characteristics of the study participants

were analyzed using descriptive statistics and expressed in terms of number and percentage (qualitative variables) and mean and standard deviation (quantitative variables). The chi-square test was used to find associations between the categorical independent (age, gender, type of disability and level of MR) and dependent (BMI status) variables. Normal distribution of data was evaluated using the Shapiro-Wilk test, kurtosis and skewness measurement and then the pearson correlation test was applied to study the correlation between chronological age and BMI. An Independent t-test was used to compare the means of BMI between two independent groups (gender). One-way ANOVA was used to compare means of BMI between more than two independent groups. All the assumptions for applying ANOVA were checked and they were met for the type of disability and level of MR but were not met for age groups, hence, one-way ANOVA was used to compare means of BMI among different types of disabilities and levels of MR. Next, we applied multiple linear regression after checking for all the assumptions (including multicollinearity and homoscedasticity) and model fitness to predict the relationship between the dependent variable (BMI) and independent variables (chronological age, gender, type of disability and level of MR). A p-value of <0.05 was considered statistically significant.

Ethical consideration

Owing to ethical concerns, permission was obtained from the Institutional Ethical Committee of Indira Gandhi Government Medical College, Nagpur.

Results

Table 1 shows the socio-demographic profile of study participants. It was seen that the mean and standard deviation of age was 17.77 ± 9.178 years (minimum=5, maximum=51, range=46); the majority of participants were≥ 21 years old, males (64.7%), and studying in vocational class (34%). It was also seen that the majority (62.7%) of study participants had mild MR followed by normal IQ/ no MR (28.7%).

Table 1: Distribution of study participants according to their sociodemographic profile.

Variables	Number	Percentage (%)
Chronological Age (years)		
5-9	50	16.7
10-13	48	16.0
14-16	74	24.7
17-20	46	15.3
≥ 21	82	27.3
Gender		
Male	194	64.7
Female	106	35.3
Education		
Pre primary	14	4.7
Primary I	34	11.3
Primary II	28	9.3
Primary III	00	00
Secondary	26	8.7
Pre vocational I	38	12.7
Pre vocational II	58	19.3
Vocational	102	34
Level of MR		
Normal/ no MR	86	28.7
Mild MR	188	62.7
Moderate MR	26	8.7
Severe MR	00	00
Profound MR	00	00

Figure 1 shows the distribution of study participants according to type of disability. It was seen that the majority, 172 (57.3%) of participants had an Intellectual and Developmental Disability (IDD), followed by autism -104 (34.7%) and Cerebral Palsy (CP)- 24 (8%).

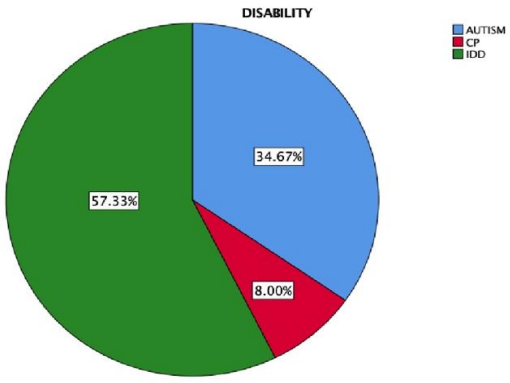

Figure 1: Distribution of study participants according to type of disability.

Figure 2 shows the distribution of study participants according to BMI status. It was seen that the majority, 164 (54.7%) of participants, had normal weight, followed by overweight weight- 54 (18%), underweight- 54 (18%) and obese- 28 (9.3%).Mean and standard deviation of BMI was 19.9 ± 5.23 (minimum=11, maximum=37.9, range= 27) and of WHR was 0.958 ± 0.134 (minimum=0.76, maximum=1.57, range= 0.81).

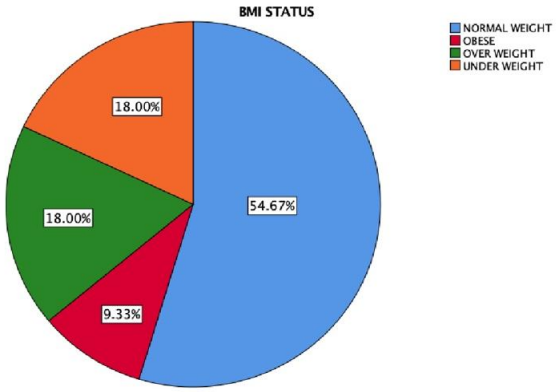

Figure 2: Distribution of study participants according to BMI status.

Figure 3 shows the correlation between chronological age and BMI. Chronological age and BMI were found to be moderately positively correlated, r(298) = 0.41, p<0.001*.

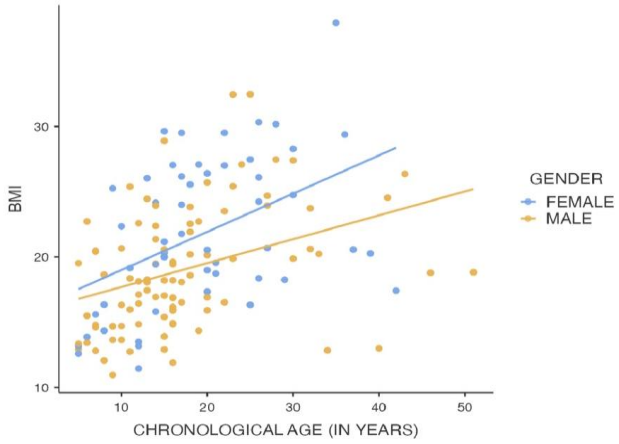

Figure 3: Correlation between chronological age and BMI.

Table 2 shows the association of some epidemiological factors with BMI status. It was found that BMI status was significantly associated with age ($\chi2$=30.6, p value=0.002*), gender ($\chi2$=9.596, p value=0.022*) and level of MR ($\chi2$=13.43, p value=0.037*)

Table 2: Association of some epidemiological factors with BMI status.

Variables	Underweight No. (%)	Normal-weight No. (%)	Over-weight No. (%)	Obese No. (%)	Total N=300	X^2-value P- value
Chronological Age (in years)						
5-9	4 (8)	34 (68)	2 (4)	10 (20)	50	$\chi2$=30.6 p=0.002 *
10-13	10 (20.8)	26 (54.2)	10 (20.8)	2 (4.2)	48	
14-16	20 (27)	40 (54.1)	10 (13.5)	4 (5.4)	74	
17-20	8 (17.4)	26 (56.5)	10 (21.7)	2 (4.3)	46	
≥ 21	12 (14.6)	38 (46.3)	22 (26.8)	10 (12.2)	82	
Gender						
Male	38 (19.6)	114 (58.8)	26 (13.4)	16 (8.2)	194	$\chi2$=9.596 p=0.022 *
Female	16 (15.1)	50 (47.2)	28 (26.4)	12 (11.3)	106	
Type of disability						
Autism	16 (15.4)	60 (57.7)	20	8 (7.7)	104	$\chi2$=8.27

			(19.2)			1
CP	4 (16.7)	18 (75)	2 (8.3)	00 (00)	24	p=0.219
IDD	34 (19.8)	86 (50)	32 (18.6)	20 (11.6)	172	
Level of MR						
Normal/ no MR	10 (11.6)	56 (65.1)	14 (16.3)	6 (7)	86	$\chi2$=13.43
Mild MR	38 (20.2)	96 (51.1)	38 (20.2)	16 (8.5)	188	p=0.037*
Moderate MR	6 (23.1)	12 (46.2)	2 (7.7)	6 (23.1)	26	

Table 3 shows the difference in mean BMI according to gender. It was found that there was a significant difference in the mean BMI of males and females (p value< 0.001*).

Table 3: Difference in mean BMI according to gender.

Gender	BMI	P value
	Mean ± SD	
Male	19 ± 4.63	<0.001*
Female	21.7 ± 5.81	

Table 4 shows the difference in mean BMI according to type of disability. It was found that there was a significant difference in the mean BMI of individuals having autism, CP and IDD (p-value = 0.015*).

Table 4: Difference in mean BMI according to type of disability.

Type of disability	BMI	P value
	Mean ± SD	
Autism	19.9 ± 5.14	0.015*
CP	17.7 ± 3.75	
IDD	20.3 ± 5.41	

Table 5 shows the difference in mean BMI according to mental retardation level. It was found that there was no significant difference in the mean BMI of normal individuals, individuals having mild and moderate MR (p-value = 0.420).

Table 5: Difference in mean BMI according to level of MR.

Level of MR	BMI	P value
	Mean ± SD	
Normal/ no MR	20.4 ± 5.10	0.420
Mild MR	19.6 ± 5.32	
Moderate MR	20.7 ± 5.06	

Table 6 shows multiple linear regression analysis of predictors of BMI. The reported model was significant, F = 20.6, p < 0.001 with adjusted R^2 = 0.208 which means that 20.8% of the variation in BMI was explained by chronological age, gender, type of disability and level of MR. The individual predictors were studied further and it was seen that chronological age (B= 0.22, p-value < 0.001, 95% CI= 0.16-0.28) and gender (B= -2.12, p-value < 0.001, 95% CI= -3.26 to -0.99) were the significant predictors of BMI. Regression equation: BMI= 17.65 + 0.22 (chronological age) – 2.12 (gender) – 0.04 (IDD) – 1.77 (CP) – 0.13 (mild MR) + 0.4 (moderate MR).

Table 6: Multiple Linear Regression Analysis of Predictors of BMI.

		BMI					
Independent variables		Estimate	SE	t	p	95% CI	
						Lower	Upper
Intercept		17.65	0.98	17.95	<.001*	15.7	19.6
Chronological age		0.22	0.03	7.28	<.001*	0.16	0.28
Gender	Female	Reference					
	Male	-2.12	0.58	-3.68	<.001*	-3.26	-0.99
Type of disability	Autism	Reference					
	CP	-1.77	1.06	-1.66	0.097	-3.86	0.32
	IDD	0.04	0.59	-0.07	0.947	-1.2	1.13
Level of MR	Normal/ no MR	Reference					
	Mild MR	-0.125	0.62	-0.20	0.839	-1.34	1.09
	Moderate MR	0.40	1.06	0.38	0.706	-1.68	2.48

Discussion

In our study, the overall mean age of participants was 17.77 ± 9.178 years; male (17 ± 9.23 years) and female (19.3 ± 8.93 years),p value= 0.037, which showed that

there was a significant difference between the mean age of male and female participants. These findings were in contrast with the findings from the study of VishvanathPise et al [9], where the mean age was 12.36 ± 1.51 years for males and 12.61 ± 1.63 years for females. In our study, 64.7% of participants were males and 35.3% were females, which were almost similar to the findings of L. T. Ptomey et al[10]in which 67.8% were male, 32.12% were female and Raghi H et al[11]in which 65.5% were males and 34.5% were females but in contrast with the findings from the study of Sahin H et al[6]where 55.7% were male and 44.3% were female. In the present study, the majority (62.7%) of participants had mild MR followed by 28.7%(normal/no MR) and 8.7% (moderate MR). In a study conducted by Sahin H et al [6], 46.7%had mild intellectual disability (MID), 28.6% had moderate intellectual disability (MOID), and 24.5%had severe intellectual disability (SID) while in a study conducted by Sanjay P et al[8], 62.3% had mild MR, 14.88% had borderline MR, 18.6% had moderate MR and 4.18% had severe MR. In our study, 57.33% had IDD, 34.67% autism and 8% CP while in a study conducted by L. T. Ptomey et al[10], 17% individuals had DS, 60.7% had ASD (Autism Spectrum Disorder) and 22% had other IDDs. In our study, 54.67% of participants were normal weight, 18% were underweight, 18% were overweight and only 9.33% were obese while in a study conducted by Cordell AA[12], 52.5% were normal weight, 25.0% overweight, 2.5% underweight and 20.0% obese and in a study conducted by Vishvanath Pise et al[9], 23.11% of participants were normal weight, 70.22% were underweight and 6.2% were overweight. In the present study, among males, 19.6% were underweight, 58.8% normal weight, 13.4% overweight and 8.2% obese while in a study conducted by Sanjay P et al[8], among males, 75.3% were underweight, 16% normal weight, 6% overweight and 2.67% obese. In the present study, among females, 15.1% were underweight, 47.2% normal weight, 26.4% overweight and 11.4% obese while in a study conducted by Sanjay P et al[8], among females, 78.46% were underweight, 16.9% normal weight, 1.5% overweight and 3.07% obese. In our study there was a significant association between gender and BMI status (p-value = 0.022) while there was no significant association between gender and BMI status in a study conducted by Sanjay P et al[8](p-value = 0.56). In our study, among individuals who were normal/ having no MR, 11.6% were underweight, 65.1% were normal weight, 16.3% were overweight and 7% were obese; among individuals with mild MR, 20.2%were underweight, 51.1% were normal weight, 20.2% were overweight and 8.5% were obese; among individuals with moderate MR, 23.1% were underweight, 46.2% were normal weight, 7.7% were overweight and 23.1% were obese. In a study conducted by Sahin H et al[6], among individuals with MID, 1.8% had severe thinness, 5.3% had thinness, 61.4% were normal weight, 14.0% were overweight and 17.5% were obese; among individuals with MOID, 2.9% had severe thinness, 2.9% had thinness, 57.1% were normal weight, 14.3% were overweight and 22.8% were obese; among individuals with SID, 3.3% had severe thinness, 16.7% had thinness, 53.3% were normal weight, 6.7% were overweight and 20% were obese. There was a significant association between the level of MR and BMI status (p-value = 0.037*) in our study while there was no significant association in a study conducted by Sahin H et al[6](p-value = 0.599). In our study, among individuals having autism, 15.4% were underweight, 57.7% were normal weight, 19.2% were overweight and 7.7% were obese; among individuals having CP, 16.7% were underweight, 75% were normal weight, 8.3% were overweight; among

individuals having IDD, 19.8% were underweight, 50% were normal weight, 18.6% were overweight and 11.6% were obese. In a study conducted by L. T. Ptomey et al[10], among children with DS, 27.0% had overweight, and 22.0% had obesity, among adults with DS, 27.3% had overweight, and 53.8% had obesity; among children with ASD, 17.5% had overweight, and 24.4% had obesity, among adults with ASD, 24.3% had overweight and 37.8% had obesity; among children with IDD, 11.8% had overweight, and 21.7% had obesity; among adults with IDD, 21.0% had overweight, and 41.4% had obesity. In our study, age and gender were found to be significant predictors of BMI. This can be interpreted as: with every one unit increase in age, BMI increases by 0.22 and with change in gender from female to male, BMI decreases by 2.12. these changes were statistically significant with p value being <0.05.

Conclusion

The majority (54.7%) of participants had normal weight, 18% were underweight,18% were overweight and 9.3% were obese. Mean and standard deviation of BMI was 19.9 ± 5.23. BMI status was significantly associated with chronological age, gender and level of mental retardation while chronological age and gender were the significant predictors of BMI.

Strength And Limitations

The present study is unique as we tried to study the difference in mean BMI among various groups like gender, type of disability and level of MR. Also we studied predictors of BMI using multiple linear regression. Limitations of this cross-sectional study are that the physical activity and food habits were not considered in this study also findings are from a single school and a small sample size; therefore the findings cannot be generalized to all the mentally handicapped individuals.

Recommendations

The BMI status of the mentally handicapped individuals should be monitored regularly, and sufficient nutritional support should be provided to ascertain a normal body weight and linear growth, also weight management interventions should be developed targeting the prevention of excess weight gain. Future research should focus on the effect of physical activity and diet on BMI of mentally handicapped individuals.

Acknowledgements

We would like to express our gratitude towards all the participants who participated in the study. We also acknowledge the immense help received from the principal and all the staff members of Jeevoday Special School, Sadar, Nagpur during data collection.

Declarations

Ethical approval: The study was approved by the Institutional Ethics Committee

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