



Effect of Obesity, Socio-Economy and Interactions on Mental Health: A Study of Adolescents in Kolkata, India

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Abstract

Background: During adolescents, indeed co morbidity burden in obesity is well explored than mental health. In this paper, we have tried to find out the relationship of mental health with obesity and different socio-economic variables among adolescents of age 10-17 years.

Methods: Mental illness such as depression, anxiety and stress were assessed through the Depression Anxiety Stress Scale (DASS Scale -21) and overweight and obesity were measured through age and sex specific above 85th and 95th percentiles of BMI values respectively according to WHO, 2006. The explanatory variables are mainly the socio-economic groups namely medium of school, religion, parent's education, parent's occupation, family size, and per capita expenditure (Rs.). We have restricted our study to only school-going children of class 5 to 10 and sample size consists of 2148 children from 10 different Bengali medium and 6 English medium schools in Kolkata. Data have been collected during September 2018 to September 2019. Among 2148 children, 1195 are boys and 953 are girls.

Results: The study reveals that among obese children, mental depression, anxiety, and stress are significantly ($p < 0.01$) higher than non-obese children. Among adolescents, the incidence of anxiety is comparatively ($p < 0.01$) higher than those of depression and stress. The study also shows that girls are suffering more than boys ($p < 0.01$). Socio-economy have a somehow impact on mental health ($p < 0.01$).

Conclusions: The cause of high mental illness during adolescence is not clear but it may be said by recent literature review that besides biological or genetic factors, social factors like social network may be regarded as very important curative options along with different voluntary and medical actions

Keywords: Mental health; Adolescent obesity; Socio-economy; Kolkata

Introduction

Adolescent period is the transitional phase from childhood to adulthood. Since tremendous physical and mental changes occur during this period, the children need to be properly handled and motivated to avoid future calamities. Adolescent is a critical time for the onset of overweight or obesity among children which is being perceived as a public health crisis [1,2]. Mental health like psychological disorders is also closely associated with this period, which may have a high chance to hamper future development [3]. WHO [4] defines "adolescent" as individual between 10 to 19 years of age. According to definition of [5] that 'Adolescence' means "to emerge" or to "attain identity" and it is the period when rapid physical and psychological development starting from the onset of puberty to complete growth and development. So, in this perspective, adolescent children need to be given special attention

because half of all the mental disorders start by the age of fourteen [6]. WHO [7] defines mental health as "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community"? Very recently, mental health problem has been considered as the most common and stigmatized condition among adolescent children [8]. One in five among 9-17 years children are affected by some degree of mental impairment and one in ten has significant mental impairment [9,10]. Among the adolescent children, the most common mental disorders are depression, anxiety and stress though it varies from person to person with different intensities. Furthermore, in worldwide distribution, gender differences of mental disorder are well established among adolescents, and it is

also notable that mental disorder also affects girls more than boys [11,12]. Anxiety and mood disorder are two to three times more prevalent among adolescent girls than boys [13].

Adolescent obesity with psychological disorder is vulnerable risk for them as well as for their future development. Because among adolescents with psychiatric disorder, excess weight may be responsible for disease burden, increase stigmatization, decreased self-esteem, attaining of social function and reduction of self-management behaviors. When one compares between non-obese and obese adolescents, it is seen that obese adolescents have a higher prevalence of mental health problems, which include low self-esteem, anxiety, depression and tendency to do suicide [14,15]. It is also seen that higher rates of both peer victimization and depression occurs more in obese children than non-obese adolescents [16]. Early stage of development of mental illness is demonstrated by poor academic performances. Significant association of psychiatric disorder, specifically depression with adolescent obesity is found by many studies [17-24]. Through some longitudinal studies, it is seen that obesity predicts depression, but depression does not predict obesity [25-27]. Depression may hang on to the stage of adulthood. Obesity is the risk factor for depressive symptoms and not for clinical depression [27]. Among the several kinds of mental health problems like depression, anxiety and stress, it is seen that both obesity and mental health illness are associated with many health problems like hypertension, coronary heart attack etc. [28]. Besides this, it is also known by several studies that during adolescent period, mental health problem is the resultant of interplay between different attributes and behaviors like genetic and social factors and economic circumstances such as socio-economic status [1].

From the above background, it can be said that physical co-morbid burden due to obesity among children, adults and adolescents is well explored but relationship between mental health and obesity among adolescents is mainly unexplored than adults. In this perspective, we would like to try to explain the condition and relationship of mental health among adolescents in different angles through the following objectives:

To understand (i) the relationship of adolescent overweight or obesity with different kind of mental health illness like depression, anxiety, and stress along with its gender difference, (ii) the association of adolescent mental health with their obesity and socio-economic variables.

Methods

Data

The study area is in Kolkata Corporation and its adjacent area. Due to obvious difficulty of identifying the children of this age group, we have restricted our study only for school-going children. Thus, the data have been collected from secondary sections (Class V- X) of Secondary or Higher Secondary schools. The total number of children is 2148, of which 1195 are boys and 953 are girls.

Measures

This is a micro level cross-sectional study using multistage stratified sampling procedure. In the first stage of sampling, due to differentiation of socio-economic background, medium of school has been considered as one of the criteria. The reason is that the upper class or more economically affluent parents try to admit their child or children in English medium school than in Bengali medium school. In our study, we have restricted our study only to two mediums like (i) English medium and (ii) Bengali medium schools. Other medium schools are very few and not considered in this study. Ten Bengali Medium Schools and six English medium schools are selected randomly for our study. Total numbers of children in English medium schools are 848 and in Bengali medium schools, it is 1300. The total number of boys and girls in English medium schools are 506 and 342 respectively. And the same in Bengali medium schools are 689 and 611, respectively. Height and weight of all the students of the selected schools have been measured by following standard techniques [29]. Body Mass Index (BMI) has been calculated by using the formula

$$BMI = (\text{Weight in Kg})/(\text{Height mts.})^2 .$$

BMI is used to classify each child into different categories of nutritional status like underweight, normal, overweight, and obese by age and gender. Age and gender specific cut-off points [30] have been taken to identify overweight and obese children. It is above 85th percentile for each age and sex category as a reference point for overweight and above 95th percentile for obesity and on the other side, below 5th percentile for undernourished [30]. The age (date of birth) and other relevant data have been verified from school records and their respective parents. Mobile numbers of their parents have been collected from the students or from school records. Other queries, if any, have been collected from guardians of the children through mobile phone or from school records. In our interview session, we also focus on the psychology part which has direct effect on human health. For assessing the mental health like normal and the magnitude of depression, anxiety and stress has been assessed through the 'DASS-21 score'. In our schedule there are 21 different questions about participant's behavior.

Analysis

For analyzing these data, we have used depression, anxiety, and stress test scale (DASS-21 score) and the result of mental state was finally divided into three categories – normal, mild, and severe. Age, sex, and obesity of the children are expected to have some effects on the depression, anxiety and stress of children. The background variables like parents' education and occupation, religion, medium of instruction, etc. may also related with the mental health problems. However, it is thought that it may be difficult to explain the mental status effectively by means of these variables by taking simple linear equations. Since these explanatory variables are dummy variables, the only way to bring in nonlinearity is by means of introducing interaction effects of these variables. There are however problems in introducing interactions effects. First, multi co linearity problems

may arise due to so many explanatory variables, especially when the variables are binary. Second, some of the original variables may cease to be significant. Thus, it may be necessary to delete some variables from the regression and retain the interaction variables instead. Carrying out the process of addition and elimination of variables along with choosing appropriate interactions and checking multi co linearity at each step is a skilled work. Though, one should make a systematic approach, still there is a trial and error involved in it.

So, in the binary logistic regression, to see the impact of obesity and socio-economy on mental health of adolescent children, the interaction terms have been taken in the regression analysis. Interactions may have profound effect on the response variable in a regression analysis. Interactions act like catalyst. Interactions are nothing but product of two variables. The usual effect either accelerates or decelerates due to the incorporation of the interaction term. Here, we have combined boys' and girls' data and have taken interaction effects. And it gives tremendous insight when the variables are binary. In both the regression analysis, we have considered the independent variables like obesity of the children where it is divided into two groups such as non-obese and obese, age groups of the children being 10-13 years and 14-17 yrs, medium of school into English and Bengali medium, religion group has been divided into two groups namely, Muslim and Non-Muslims. Parents' educational level is divided into two categories based on class passed - (i) 0-9 and (ii) 9 & above. Occupation of parents is divided into two categories like not working and working. Household size is grouped into two categories, namely the households with number of members 'less than 4' and '4 or more'. Per capita expenditure (RS.) is categorized into two groups such as 0-3700 and 3700 and above. Different kinds of mental disorder such as Depression, Anxiety and stress are considered as dependent variables. Dependent variable is coded as '1' if there is depression and 0 the student is normal. Similar codes are given for Anxiety and Stress. An estimated odd ratio of '1' indicates that the nature of dependent variable is not different from the reference category. If the estimated odd ratio is >1, the probability of becoming mental health illness is more in this

category compared to the reference category and if it is <1, then it is just opposite to that of '>1' case. Significance levels of $p < 0.01$, 0.05 and 0.1 have been considered. All the statistical analyses are done by 23.0 versions of SPSS (Statistical Package for Social Science).

Results

Descriptive statistics

Table 1 presents the relationship between the symptoms of mental depression and nutritional status of adolescent children with its gender differences. Table shows that in general among 10-17 years children, prevalence of mental depression is more among girls (42.1%) than boys (35.9%) and it also shows a direct relationship between mental depression and obesity. Depression of obese adolescent is higher (44.4%) than that of underweight or normal adolescent children (41.2%). Table 2 represents the relationship status between the symptoms of mental anxiety and nutritional status of adolescent children with gender differences. Here also, it is markedly noticed that percentage of anxiety among girls (71.5%) is higher than among boys (58.9%). There is also a direct relationship between mental anxiety and obesity. When mental anxiety level increased, the percentage of obesity also increased. The percentage of mental depression is 61.9% among boys for obese children in comparison to normal or underweight, they are 56.1% and 58.7% respectively. Similarly, among overweight or obese girls, percentage of anxiety is 75.1% and it is a bit less among normal (69.8%) and underweight (68.8%) respectively. Table 3 presents the relationship between the symptoms of mental stress and nutritional status of adolescent children with gender variation. Here also the similar trend is noticed that 34.1% boys and 45.1% girls are mentally stressed during adolescent period. There is also a direct relationship between mental stress and obesity which is same as depression and anxiety. The percentage of mentally stressed (39.7%) is seen among overweight or obese group of boys compared to 32.0% and 27.0% among normal and underweight boys respectively. Among overweight girls, percentage of anxiety is 44.6% and among normal and underweight girls, the percentages are 44.7% and 46.5% respectively.

Table 1: Percentage distribution of mental Depression among different nutritional status of adolescent children in Kolkata.

| Nutritional Status | Depression | | | | | | | |
|--------------------|------------|--------|------|--------|-------|--------|------|--------|
| | Boys | | | | Girls | | | |
| | N | Normal | Mild | Severe | N | Normal | Mild | Severe |
| Underweight | 216 | 65.7 | 19 | 15.3 | 200 | 61.5 | 17 | 21.5 |
| Normal | 513 | 67.8 | 16 | 16.2 | 406 | 57.9 | 15 | 27.1 |
| Overweight/Obese | 466 | 58.8 | 19.5 | 21.7 | 347 | 55.6 | 15.9 | 28.5 |
| Total | 1195 | 63.9 | 17.9 | 18 | 953 | 57.8 | 15.7 | 26.4 |

Table 2: Percentage distribution of mental Anxiety among different nutritional status of adolescent children in Kolkata.

| Nutritional Status | Depression | | | | | | | |
|--------------------|------------|--------|------|--------|-------|--------|------|--------|
| | Boys | | | | Girls | | | |
| | N | Normal | Mild | Severe | N | Normal | Mild | Severe |
| Underweight | 220 | 41.4 | 23.2 | 35.5 | 202 | 31.2 | 19.3 | 49.5 |
| Normal | 518 | 43.8 | 21.4 | 34.7 | 410 | 30.2 | 18.3 | 51.5 |
| Overweight/Obese | 465 | 38.1 | 19.1 | 42.8 | 350 | 24.9 | 23.7 | 51.4 |
| Total | 1203 | 41.1 | 20.9 | 38 | 962 | 28.5 | 20.5 | 51 |

Table 3: Percentage distribution of mental Stress among different nutritional status of adolescent children in Kolkata.

| Nutritional Status | Depression | | | | | | | |
|--------------------|------------|--------|------|--------|-------|--------|------|--------|
| | Boys | | | | Girls | | | |
| | N | Normal | Mild | Severe | N | Normal | Mild | Severe |
| Underweight | 224 | 72.8 | 13.4 | 13.8 | 200 | 53.5 | 11.5 | 35 |
| Normal | 519 | 68 | 15 | 17 | 405 | 55.3 | 18.3 | 26.4 |
| Overweight/Obese | 466 | 60.3 | 18 | 21.7 | 345 | 55.4 | 16.8 | 27.8 |
| Total | 1209 | 65.9 | 15.9 | 18.2 | 950 | 54.9 | 16.3 | 28.7 |

Multivariate results

Table 4 summarizes the level of association between mental health illness such as depression, anxiety and stress with obesity and different socio-economic variables by gender differences through binary logistic regression analysis. Analysis reveals that both obese boys and girls are suffering from more depression, anxiety and stress than non-obese children and these results are statistically significant except among stressed girls. Higher age group (14-17 yrs) adolescent are suffering from significantly more mental health problems than early age group (10-13 yrs.) boys and girls. Children of English medium schools have more mental health

problem than Bengali medium schools. Muslim children are less depressed than non-Muslim children, but Muslim children suffer from more anxiety and stress than non-Muslim children. Father's education has inverse relationship with mental health problems of their children and mother's education have direct relationship with the mental health problem of their children. The children of working mothers are more affected by mental disorder than non-working mothers but there is no clear indication with father's working status. Household size of the family has no clear implications on mental health. In general, economic status of the family has an indirect relationship with the welfare of mental health.

Table 4: Categorical logistic regression of mental depression, anxiety and stress of adolescent children in relation to different socio-economic variables.

| Independent variables | Depression | | Anxiety | | Stress | |
|-----------------------------|------------|-------------|---------|---------|----------|----------|
| | Girls | Boys | Girls | Boys | Girls | Boys |
| Obesity | | | | | | |
| Non-obese® | 1 | | 1 | 1 | 1 | 1 |
| Obese | 1.18 | 1.001.413** | 1.408** | 1.308** | 0.986 | 1.518*** |
| Age group | | | | | | |
| Oct-13 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14-17 | 1.487*** | 1.482*** | 1.447** | 0.836 | 1.917*** | 1.106 |
| Medium of the school | | | | | | |
| Bengali® | 1 | 1 | 1 | 1 | 1 | 1 |
| English | 2.570*** | 1.119 | 1.28 | 1.003 | 1.188 | 0.772 |
| Religion | | | | | | |
| Muslim® | 1 | 1 | 1 | 1 | 1 | 1 |

| | | | | | | |
|----------------------------|--------|----------|---------|-------|-------|-------|
| Non-Muslim | 1.076 | 1.689 | 0.484* | 1.109 | 0.947 | 0.576 |
| Father's education | | | | | | |
| 0-9 [®] | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 or more | 0.684* | 0.895 | 0.767 | 0.946 | 0.838 | 1.23 |
| Mother's education | | | | | | |
| 0-9 [®] | 1 | 1 | 1 | 1 | 1 | 1 |
| 9 or more | 0.987 | 1.243 | 1.125 | 1.123 | 0.929 | 1.288 |
| Mother's occupation | | | | | | |
| Not working [®] | 1 | 1 | 1 | 1 | 1 | 1 |
| Working | 1.035 | 1.005 | 0.664** | 0.791 | 1.063 | 1.141 |
| Father's Occupation | | | | | | |
| Not working [®] | 1 | 1 | 1 | 1 | 1 | 1 |
| Working | 1.002 | 0.942 | 0.635 | 0.65 | 1.28 | 0.841 |
| Household size | | | | | | |
| 1-3 [®] | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 or more | 0.992 | 1.03 | 0.893 | 1.114 | 0.997 | 0.936 |
| Per capita exp. | | | | | | |
| 0-3799.999(R) | 1 | 1 | 1 | 1 | 1 | 1 |
| 3800 & above | 0.857 | 1.624*** | 0.881 | 0.632 | 0.87 | 0.968 |

® Reference category; <0.01: 1% level ***; 0.01 - <0.05: 5% level **, 0.05-<0.1-10.0% level*.

Table 5: Binary logistic regression of mental depression, anxiety and stress of adolescent children in relation to different socio-economic variables through interaction effects of boys and girls.

| Independent variables | Depression Coefficient (p value) | Anxiety Coefficient (p value) | Stress Coefficient (p value) |
|---|----------------------------------|-------------------------------|------------------------------|
| Obesity (Non-obese ®) | | | |
| Obese | 0.157(0.268) | 0.290 (0.058) * | 0.00. (0.983) |
| Medium of Instruction (Bengali) | | | |
| English | 0.952(0.000) *** | 0.321 (0.038) ** | 0.219(0.117) |
| Mother's education (0-9®) | | | |
| 9 or more | -0.032 (0.854) | -0.040 (0.824) | -0.291(0.090) * |
| Mother's occupation (Not working®) | | | |
| Working | -0.023(0.855) | -0.273(0.025) ** | 0.041 (0.736) |
| Age × Sex (Age 13 years or less or Girls ®) | | | |
| More than 13-year boys | -0.028 (0.880) | -0.380 (0.050) ** | -0.526 (0.006) *** |
| Age × Education of father (Age 13 years or less and education of father 0-9 class ®) | | | |
| Age more than 13 years and higher educated father | -0.228 (0.365) | -0.343 (0.202) | -0.452(0.073) * |
| Age × Education of mother (Age 13 years or less and education of mother 0-9 class ®) | | | |
| Age more than 13 years and higher educated mother | 0.014(0.958) | 0.464(0.091) * | 0.440 (0.100) |
| Age × Religion (Age 13 years and less and Muslim) | | | |
| Age more than 13 years and non-Muslim | 0.056(0.003) *** | 0.020(0.316) | 0.062(0.001) *** |
| Sex × Education of Mother (Girls and education of mother 0-9 class ®) | | | |
| Boys and higher educated mother | 0.250(0.264) | -0.035(0.873) | 0.455(0.040) ** |

| Sex × Religion (Girls and Muslim ®) | | | |
|---|-------------------|----------------|------------------|
| Boys and Non-Muslim | -0.026(0.150) | -0.021(0.228) | -0.051(0.003)*** |
| Sex × Obesity (Girls and Non-obese ®) | | | |
| Obese boys | 0.215(0.255) | -0.096(0.623) | 0.406(0.030)** |
| Sex × Medium of education (Girls and Bengali medium school ®) | | | |
| Boys in English medium schools | -0.623 (0.001)*** | -0.360(0.067)* | -0.487 (0.010)** |

®Reference category; <0.01: 1% level ***; 0.01 - <0.05: 5% level **; 0.05-<0.1 - 10.0% level*.

Table 5 shows the relationship of mental health, obesity, and socio-economy along with interaction effects as it is seen from Table 4 that only a few variables affect the mental status significantly. The table shown here is a result of a process of addition and elimination of variables and interaction terms of many trial and errors. We have found the following interaction variables to have significant effect on at least one of the three mental health problems taken in the paper. These are age with sex, age with education of mother, age with religion, sex with education of mother, sex with religion, sex with obesity and sex with medium of education. It is already seen that young adolescents are less likely to be victim of mental illness. But interaction effects further tells that the chance of suffering from mental health problems is less among higher aged adolescent boys compared to young adolescent girls. Higher aged adolescents with father's education level such as higher secondary or more have less chance of becoming victim of mental illness compared to younger adolescents with less education of father. But it is just the opposite among higher aged adolescents with higher educated mothers compared to younger adolescents with less education of mother. Muslim children have less chance of suffering from mental health problems especially at young age. Sex also plays a vital role on the mental health of the adolescents. Non-Muslim boys are less prone to be mentally ill than Muslim girls. So, English medium boys compared to Bengali medium girls. However, the effect of interaction with sex and level of education of mother has mixed effect on mental health of adolescents. Obese boys have more chance of becoming mentally ill so far as depression and stress are concerned.

Discussion

Adolescent period is the transition period when children undergo physical and mental stress leading to mental illness, which may extend in adulthood or late adulthood [31]. And it is reported by WHO [31] that 20% of adolescents worldwide experience mental disorder such as depression, anxiety, and stress. The present study shows that the state of mental health among the adolescent (10 - 17 yrs.) children in Kolkata and its association with obesity and different socio-economic factors. The study was done among 2148 children, among them, 1195 are boys and 953 are girls. For assessing the mental health illness, we have used three categories of mental disorders like depression, anxiety and stress. The first objective of the study was to see the relationship of adolescent obesity with mental health. The result shows that obese adolescents have higher prevalence of mental health problems than normal and underweight children. Mental anxiety is also directly

related with obesity because, among overweight or obese girls and boys, incidences of anxiety are found to be 75.1% and 58.9% respectively and both these percentages are the highest among the three groups - overweight or obese, normal and underweight. Mental stress was also found to be associated with obesity. There has been a marked gender difference of occurrences of mental illness. Prevalence of mental depression, anxiety and stress among girls are 42.1%, 71.5% and 45.1% respectively as against 35.9%, 58.9% and 34.1% respectively among boys, which corroborates with the study of [11, 12].

Analysis reveals that during adolescence, both obese boys and girls suffer more from depression, anxiety, and stress compared to non-obese children. Obesity, thus, seems to be the most disturbing factor towards rise of depression, anxiety and stress among adolescent boys and girls. Age group is another factor, which increases the chances of depression, anxiety and stress because higher age group children are more prone to be victims of mental illness. This study coincides with the study [32]. Boys in English medium schools are less prone to Depression, Anxiety or Stress. Children of higher educated father are less affected by depression, anxiety and stress. But in case of higher educated mother, the result is not clear though it is seen that boys are always affected by mental disorder. It is possible that higher educated mother expects much from their children and thus the children gradually develop complexities if they cannot meet the expectation of their mothers. This aggravates as their age increases. For working mother, both girls and boys are always more affected by depression and stress than non-working mother and but for anxiety, the children of working mother have less anxiety than non-working mother. In case of father's occupation, among the children of working father, general tendency is not being affected by mental disorder than not working father. Household size has no clear impact on mental health. The children in the higher income families have less chance to be affected by mental disorder than lower income group.

Conclusion

Children of working mothers are seen to be more affected by mental problems. It indirectly tells us that children need to be in touch with their parents in any endeavor. It has also been found in this paper that prevalence of mental depression, anxiety and stress are more among girls than among boys and there is a direct relationship between mental depression and obesity. It is thus the duty of the parents to see that their children do not become overweight or obese. Higher age group children are more prone to

be a victim of mental illness. Interaction effects further tells that the chance of suffering from mental health problems is less among higher aged adolescent boys compared to young adolescent girls. Obese boys have more chance of becoming mentally ill so far as depression and stress are concerned. Is it because, as age increases the children gradually move away from the attention of the parents? Causes of gender differences for mental illness are not clear but it is known that less occurrences of mental illness among boys than girls are due to less sensitive attitude towards the outside world among boys than girls. On the other hand, girls are most emotionally sensitive [33] by nature. Moreover, they experience more violence, abuses, and school performance pressure [12-34] as they are less mobile than boys.

Limitations of the study

The study is limited to the school going children of Calcutta metropolitan area. Also, Hindi medium and other language medium schools have been eliminated from the study. Thus, it is not a representative sample of all adolescent children in the area. Needless to mention that one should not generalize the results to the population of all adolescent children of West Bengal. More studies are needed in order to generalize the results.

Declarations

Ethics statement: This study was a part of a project, and it was approved by Indian Statistical Institute (ISI). The report of the project was completed and submitted to ISI, and it was accepted. Consent was taken from the school authorities. Besides, the collection of data was completely voluntary. Also, the guardians of the sampled students were informed, and the guardians were asked to give the relevant information by filling up the forms sent through the children.

Consent for publication

Not applicable to this study.

Availability of data and material

Data is available on request.

Abbreviations

BMI: Body Mass Index, **DASS Scale:** Depression Anxiety Stress Scale, **SPSS:** Statistical Package for Social Science, **WHO:** World Health Organization

Competing interests

The authors have no conflict of interest.

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Authors Contributions

SB designed the study. SB, MP and PB drafted the manuscript. GH, PB, MP were involved in data interpretation and statistical

analysis. SB, PB, MP, GH critically revised the manuscript. All the authors read and approved the manuscript.

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