

## REVIEW ARTICLE

# The impact of obesity prevention interventions on the mental health and well-being of adolescents: A systemic review

<sup>1</sup>Dr. Saurabh Jaiswal, <sup>2</sup>Dr. Ganga Ram Yadav, <sup>3</sup>Dr. Abhinav Kuchhal, <sup>4</sup>Dr. Ashwini Kumar Kuchhal

<sup>1,2</sup>Assistant Professor, Hind Institute of Medical Sciences, Ataria, Sitapur, Uttar Pradesh, India

<sup>3</sup>Assistant Professor, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, India

<sup>4</sup>Associate Professor, Department of Psychiatry, SRMS Institute of Medical Sciences, Bareilly, Uttar Pradesh, India

### Corresponding Author

Dr. Abhinav Kuchhal

Assistant Professor, Rohilkhand Medical College & Hospital, Bareilly, Uttar Pradesh, India

Email: [neuropsychiatrist2020@gmail.com](mailto:neuropsychiatrist2020@gmail.com)

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### ABSTRACT

**Background:** The common mental disorders i.e., depression and anxiety, are now presenting as major global public health problems. Limited evidences are available regarding burden of overweight and obesity and its association with mental health and role of intervention programmes in well being among children and adolescents in Indian scenario. Psychosocial factors work against the child with a weight problem and thus hamper his/her overall growth and development. **Methodology:** A systematic literature search was performed in PubMed, Embase, Google scholar, clinical trial.gov and Cochrane Library through March 2023 in the English language by two independent authors using a structured search strategy. Primary efficacy outcomes of the study were to find the the impact of obesity prevention interventions on the mental health and well-being of adolescents so that intervention strategies can be planned accordingly and intervention programmes can be given importance accordingly. **Results:** Total number of obese adolescents analysed in the present study are 6469 aged 11-18 years. The family communication and function, as well body image satisfaction indirectly affected psychological well-being through self-esteem and depression. The physical exercise, improvements in diet quality were mirrored by improvements in mental health over the follow-up period, while deteriorating diet quality was associated with poorer psychological functioning. The effectiveness of a community-based obesity prevention intervention designed to prevent obesity with a dual specific mental wellbeing objective in improving depressive symptomatology. **Conclusion:** The present study found that there is scarcity of research that reports impact of intervention programs on mental health among adolescents. In addition of assessing youth overweight status, mental health related problems must be addressed. it is pivotal to understand the range of individual, social and environmental mechanisms leading to obesity and mental illness, and help identify policies, interventions and strategies that will change the future trajectory and 'disease burden' in our country.

**Keywords:** Anxiety; Depression; Mental illness; Obese; Overweight; Intervention

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### INTRODUCTION

There are 253 million adolescents in the age group 10-19 years in India. This age group comprises of individuals in a transient phase of life requiring nutrition, education, counseling and guidance to ensure their development into healthy adults.<sup>1</sup> Owning to unhealthy lifestyle factors i.e., poor diet as well as lack of physical activity, children with obesity have increased risks for metabolic diseases and poor mental health.<sup>2,3</sup> The consequences of childhood and adolescent obesity include earlier puberty and menarche in girls, type 2 diabetes and increased incidence of the metabolic syndrome in youth and adults, and obesity in adulthood.<sup>4</sup>

Mental disorder is a common comorbidity of obesity.<sup>5</sup> The World Health Organization (WHO) framework for the underlying causes of noncommunicable disease (NCD) proposes that physical inactivity and unhealthy diet are among the key modifiable lifestyle risk behaviours that underlie most NCD's.<sup>6</sup> Morrison KM et al<sup>5</sup> studied depressive symptoms using the Center for Epidemiological Studies Depression Scale for Children questionnaire among youth aged 8-17 years at the time of entry to a weight management program and reported depression was common in this population affecting 36.4% of them. In multivariate analysis, the extent of obesity predicted both depression and low HRQOL scores.

Adolescent obesity prevention remains a high priority given negative health consequences of overweight/obesity both during adolescence and later in life. It has been suggested that prevention efforts should be community-based to meet the complex and multidimensional nature of obesity.<sup>7</sup> Though, the effects of lifestyle interventions on adolescent's mental health outcomes have been understudied. The present study was carried to study the impact of obesity prevention interventions on the mental health and well-being of adolescents.

## MATERIALS AND METHODS

The inclusion criteria were framed as per internationally standardized PICOS framework, as recommended by PRISMA guidelines:

**Participants/population:** The study population included patients who were suffering from obesity and mental illness.

**Intervention:** Since we considered the studies that examined the impact of obesity prevention interventions on the mental health and well-being of adolescents, association among obesity or overweight or mental illness, may not have referred to the term "obesity", depression or overweight in the title or abstract, we also searched for studies association of obesity prevention interventions on the mental health and well-being of adolescents. We restricted our analysis to human studies, and placed no restrictions on language. We included studies if they were peer-reviewed reports of cohort, case-control, or cross-sectional studies that either presented or allowed to study the relationship between obesity intervention programme and mental health and that controlled for possible confounding by age or age groups.

We excluded studies if they were any of the following: case studies and reviews; studies that did not provide effect estimates in odds ratios, rate ratios, or risk ratios, or did not allow the computation of such; studies that did not adjust for age; studies that did not report any effects on mental health; anonymous reports; and duplicate reports on previously published studies.

**Comparator(s)/control:** Studies of any of the above-mentioned interventions was included, including studies with no comparator group

**Outcome:** Primary efficacy outcomes of the study were to find the the impact of obesity prevention interventions on the mental health and well-being of adolescents so that intervention strategies can be

planned accordingly and intervention programmes can be given importance accordingly.

**Study design:** The review included all types of experimental studies, observational studies and case series which have reported the outcomes of the above-mentioned intervention programmes.

## INCLUSION CRITERIA

Studies conducted anywhere in the world and articles published in and after 2010 through March 2023 was included in the study. Only those studies published in English language, academic peer-reviewed journals were included in the review.

## EXCLUSION CRITERIA

Case studies was excluded from the study

Studies conducted on animals were excluded from the study.

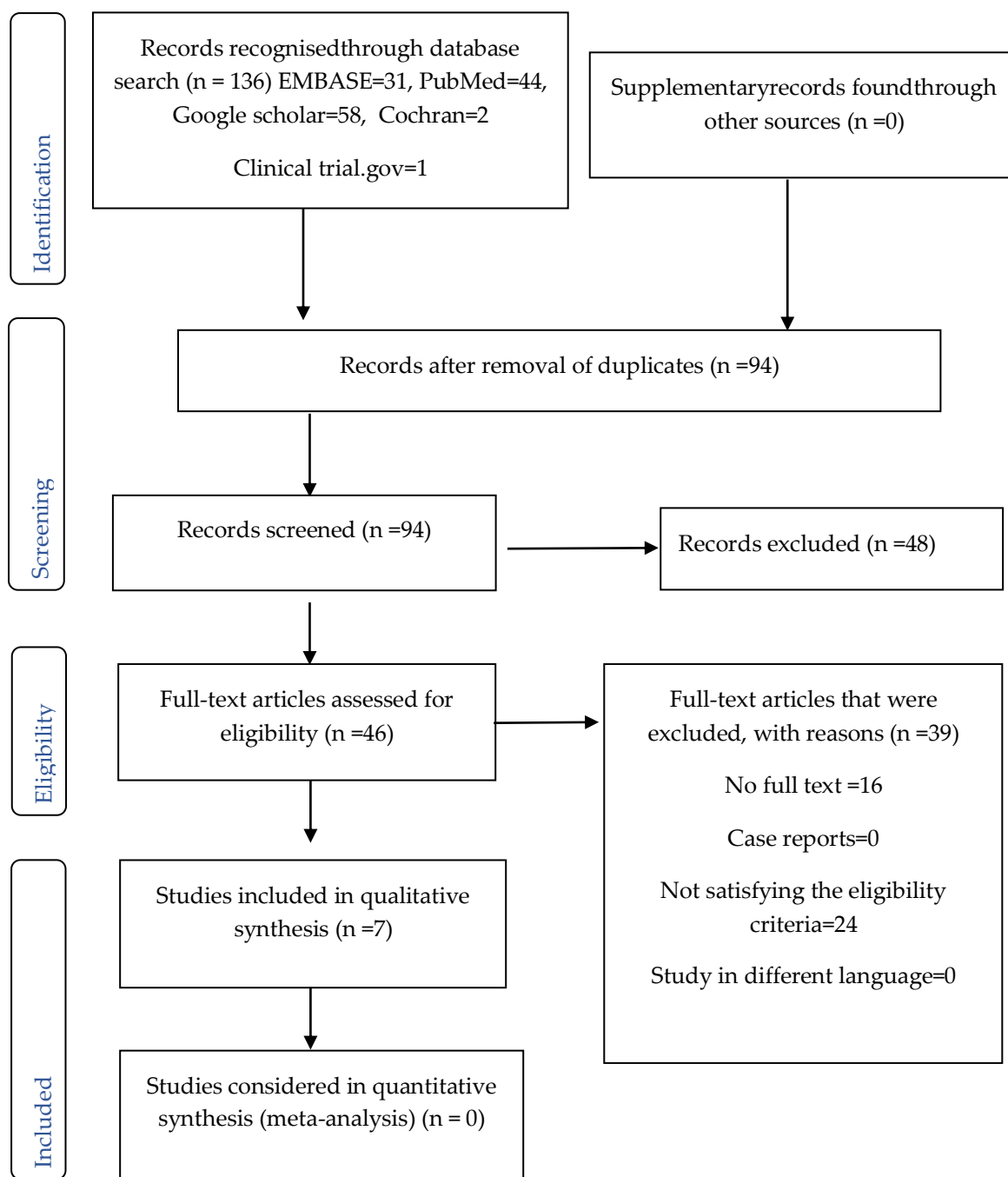
## LITERATURE SEARCH

A systematic literature search was performed in PubMed, Embase, clinical trial.gov and Cochrane Library through March 2023 in the English language by two independent authors using a structured search strategy. The searches were screened by the references of selected articles to find those that did not appear in the search databases. Additional references were not obtained by free internet search from Google as the number of studies were large. The detail search strategy is given in Table 1.

## PROCESS OF SCREENING AND SELECTION OF ARTICLES

All the citations along with the title and abstract was added to a specified endnote library and final list of studies to be screened for inclusion in the study was prepared by removing the duplicates. Two researchers carefully screened the articles by assessment of the title and thorough reading the abstracts to shortlist the studies which are likely to satisfy the inclusion criteria of the review. Attempts were made to obtain full-text articles for all these shortlisted studies, and thorough assessment was done for the satisfaction of inclusion and exclusion criteria. Studies not satisfying inclusion criteria was excluded further. The list of excluded studies and the reasons for exclusion were presented in the "characteristics of excluded studies" table. "PRISMA flow chart" was used to clearly represent the screening and selection process. (Figure 1).

**Figure 1: PRISMA 2009 Flow Diagram**



**DATA EXTRACTION**

Data was thoroughly read through and were extracted from included studies was extracted manually on to a structured data extraction form. The were studied.

**RISK OF BIAS IN INDIVIDUAL STUDIES**

The methodological quality of studies included in the systemic review was assessed according to Fowkes and Fulton quality assessment.<sup>8</sup>

**STUDY OUTCOME**

Total number of obese adolescents analysed in the present study are 6469 aged 11-18 years (table 1).

Total 7 studies were found who reported the impact of various obesity intervention programs on mental health over a period prevailing from 2010. The present study could find various studies reporting association of mental illness in context to obese adolescents in Indian scenario but could not find any study reporting the role of intervention programmes on impact of obesity prevention over the mental health and well-being of adolescents. We found one study each from Iran, Spain, Main island of Tongatapu, Fiji, Minnesota in USA and two studies from Australia reporting role of various intervention programs and their impact on mental health. Table 2 evaluates various intervention

programs and their impact on mental health. In a study by KavehFarsani Z et al,<sup>9</sup> family communication and function, as well body image satisfaction indirectly affected psychological well-being through self-esteem and depression. Romero-Pérez EM et al<sup>10</sup> reported that physical exercise program each lasting 50 min, for 20 consecutive weeks found that the improvement in positive thoughts was correlated with a lower number of depressive thoughts in children with obesity. Malakellis Met al<sup>11</sup>reported improvement in depressive symptomatology. Jacka FN et al<sup>12</sup>reported that improvements in diet quality were mirrored by improvements in mental health over the follow-up period, while deteriorating diet quality was associated with poorer psychological functioning. Another study by Fotu KF et al<sup>13</sup>found that behavioural changes did not follow a clear positive pattern. Mond J et al reported that obesity was no longer associated with lower self-esteem or with higher depressive mood after the effects of BD were statistically controlled. Pacific Obesity Prevention in Communities project undertaken with Fijian adolescents conducted by Kremer P et al<sup>14</sup>reported that increase in quality of life was observed in the intervention group. A study by Malakellis M et al<sup>11</sup>reported the effectiveness of a community-based obesity prevention intervention designed to prevent obesity with a dual specific mental

wellbeing objective in improving depressive symptomatology.

Pediatric Quality of Life Inventory (PedsQL) was used by Malakellis M et al,<sup>11</sup>Kremer P et al<sup>14</sup>and Jacka FN et al<sup>12</sup> for studying the impact of intervention program on mental health; where higher scores mean better mental health, before and after adjustments for age, gender, socio-economic status, dieting behaviours, body mass index and physical activity. Mond J et al<sup>15</sup>used project EAT (Eating and Activity over Time) of the determinants of dietary intake and reported impairment in the emotional well-being of overweight adolescents, where this is observed, may be primarily due to the effects of weight-related body dissatisfaction (BD) (table 3).

The present study found that there is scarcity of research that reports impact of intervention programs on mental health among adolescents. In addition of assessing youth overweight status, mental health related problems must be addressed. As the various studies report association between mental health problems and youth overweight and in developing countries like ours where mental health is ignored among adolescents and most importantly as this group is the future potential of nation, it is crucial that public health programs should target comorbid mental health problems among overweight youth.

**Table 1: Various studies reporting impac**

Author	Year	Country	Total number of participants	Age group	Male	Female
KavehFarsani Z et al <sup>9</sup>	2020	Iran	173	12 to 14 years, and 53.2% were between 15 and 16 years.	-	173
Romero-Pérez EM et al <sup>10</sup>	2020	Spain	105	10.02 ± 0.79 years	-	-
Malakellis M et al <sup>11</sup>	2017	Australia	656	12–16 years	-	-
Jacka FN et al <sup>12</sup>	2011	Australia	3040	11-18 years	-	-
Fotu KF et al <sup>13</sup>	2011	Main island of Tongatapu	815	11–19 years (Mean age 14.4±2 years)	46%	54%
Kremer P et al <sup>14</sup>	2011	Fiji	874	13-18 years (Mean age 15.4±0.9 years)	46%	54%
Mond J et al <sup>15</sup>	2011	Minnesota, USA	806	mean age = 12.8 years) and late (17.3 years) adolescence.	440	366

**Table 2: Evaluation of various intervention programs and impact on mental health**

Author	Year	Intervention program/ or scale for measurement	Impact on mental health	Findings
KavehFarsani Z et al <sup>9</sup>	2020	Center for Epidemiological Studies Depression Scale for Children (CES-DC),	All pathways of family communication and function and body image to the	depression and self-esteem acted as mediating variables between independent and

		Rosenberg self-esteem scale (RSES), Ryff's Psychological Wellbeing (PWB) scale, McMaster Family Assessment Device dimensions	psychological well-being through the mediating variables of self-esteem and depression, were statistically significant.	dependent variables, including family functioning and communication, body image satisfaction, self-esteem, and depression.
<b>Romero-Pérez EM et al<sup>10</sup></b>	2020	Physical exercise program, distributed in two weekly sessions, each lasting 50 min, for 20 consecutive weeks	The implementation of a physical exercise program in children with obesity favors the appearance of positive thoughts, with improvements in their emotional well-being, self-perception and self-concept	The improvement in positive thoughts was correlated with a lower number of depressive thoughts in children with obesity
<b>Malakellis M et al<sup>11</sup></b>	2017	The Australian Capital Territory 'It's Your Move!' (ACT-IYM) project, The Adolescent Behaviours, Attitudes and Knowledge Questionnaire (ABAKQ), The Pediatric Quality of Life Inventory 4.0 (PedsQL, generic module for 13–18 year olds)	Improved depressive symptomatology.	Demonstrated the effectiveness of a community-based obesity prevention intervention designed to prevent obesity with a dual specific mental wellbeing objective in improving depressive symptomatology.
<b>Jacka FN et al<sup>12</sup></b>	2011	Pediatric Quality of Life Inventory (PedsQL), where higher scores mean better mental health, before and after adjustments for age, gender, socio-economic status, dieting behaviours, body mass index and physical activity.	Improvements in diet quality were mirrored by improvements in mental health over the follow-up period, while deteriorating diet quality was associated with poorer psychological functioning.	The higher Pediatric Quality of Life Inventory (PedsQL) scores mean better mental health, before and after adjustments for age, gender, socio-economic status, dieting behaviours, body mass index and physical activity.
<b>Fotu KF et al<sup>13</sup></b>	2011	Ma'alahi Youth Project, a quasi-experimental design	smaller increase in the adolescents from Tongatapu (intervention group) compared to the less urbanized, outer island of Vava'u (comparison group). Further analyses or s	Behavioural changes did not follow a clear positive pattern
<b>Kremer P et al<sup>14</sup></b>	2011	Pacific Obesity Prevention in Communities project, undertaken with Fijian adolescents.	At follow-up, the intervention group had lower percentage of body fat (-1.17) but also a lower increase in quality of life (Assessment of Quality of Life instrument: -0.02; Pediatric Quality of Life Inventory: -1.94)	increase in quality of life
<b>Mond J et al<sup>15</sup></b>	2011	Project EAT (Eating and Activity over Time) of the determinants of dietary	Impairment in the emotional well-being of overweight adolescents,	Obesity was no longer associated with lower self-esteem or with higher

		intake	where this is observed, may be primarily due to the effects of weight-related body dissatisfaction (BD).	depressive mood after the effects of BD were statistically controlled
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**Table 3: Duration and type of study**

Author	Year	Duration and type of study	Conclusion
KavehFarsani Z et al <sup>9</sup>	2020	Cross sectional study	Family communication and function directly affected adolescents' psychological well-being. Moreover, family communication and function, as well body image satisfaction indirectly affected psychological well-being through self-esteem and depression.
Romero-Pérez EM et al <sup>10</sup>	2020	20 consecutive weeks, longitudinal comparative study	Regular physical exercise practice has positive effects on mental health
Malakellis M et al <sup>11</sup>	2017	2 years, quasi-experimental design,	This study supports growing awareness of the interconnectedness of nutrition, physical activity and mental health, which is important given the significant proportion of adolescents suffering from mental health symptoms and the need for effective prevention strategies.
Jacka FN et al <sup>12</sup>	2011	2 years, cross-sectional prospective study	This study highlighted the importance of diet in adolescence and its potential role in modifying mental health over the life course.
Fotu KF et al <sup>13</sup>	2011	3 years, experimental design with a longitudinal cohort follow-up	Community-based interventions in high obesity prevalence groups may require more intensive or longer interventions, as well as specific strategies targeting the substantial socio-cultural barriers to achieving a healthy weight.
Kremer P et al <sup>14</sup>	2011	3-year obesity prevention study,	failed to demonstrate the efficacy of a community capacity-building approach
Mond J et al <sup>15</sup>	2011	a prospective, epidemiological study	The findings are consistent with the view that BD is central to the health and well-being of children and adolescents who are overweight and that distress associated with negative body image may warrant greater attention in the context of obesity prevention and treatment programs.

**DISCUSSION**

Numerous psychosocial problems have been shown to be strongly associated with obesity in children and adolescents. These include depression, poor self-image, and adjustment difficulties in both the home and social environment (including school).<sup>16</sup> These negative impacts of overweight and obesity on health and psychological wellbeing are significant and the multi-strategy and multi-setting obesity prevention

interventions have the giant potential to impact the current global obesity epidemic.<sup>11</sup> The common mental disorders (CMDs) depression and anxiety, are now presenting as major global public health problems. Importantly, recent evidence from large-scale prospective cohort studies suggest that physical inactivity and unhealthy diet, are related to the genesis of the CMDs.<sup>12,17-22</sup>

Psychosocial factors work against the child with a weight problem and thus hamper his/her overall growth and development. Overweight and obese adolescents tend to have poor body image and low self-esteem. Among obese children, appearance related teasing is more frequent and is associated with higher weight concerns, more loneliness, poor self-perception of physical appearance, higher preference for sedentary or isolated activities and lower preference for social activities. Social isolation and stress could interfere with their learning and lead to depression, anxiety, and/or emotional instability.<sup>16</sup> Limited evidences are available regarding burden of overweight and obesity and its association with mental health and role of intervention programmes in well being among children and adolescents in Indian scenario. The choice of adolescence for the present study is due to the fact that adolescence is a high-risk period for overweight and obesity since it causes fundamental changes in body composition, insulin sensitivity, eating behaviors, activities, and psychological adjustment.<sup>9</sup>

Studies reporting overweight and obesity and relation to mental distress i.e., Bharati S et al<sup>23</sup> conducted study among obese adolescents in Kolkatta, India reported that mental depression, anxiety, and stress are significant among obese adolescents and anxiety was comparatively higher than those of depression and stress. Kaveh Farsani Z et al<sup>24</sup> reported that the obese students had higher Children's depression inventory (CDI) scores and lower scores in the Rosenberg self-esteem scale and PWB compared to the control with a significant difference and recommended psychological interventions for the minimization of mental health consequences. Jari M et al<sup>25</sup> found that 62.6% had depression, 49.4% had insomnia among overweight and obesity adolescents and reported that the positive attitude of family and peers to fatness in adolescence reduces risk of psychological distress. Sanders RH et al<sup>3</sup> evaluated the associations between childhood obesity and physical and psychological health co-morbidities among participants residing in Australia aged 0–18 years. Evidence suggests that overweight/obese Australian children and adolescents, compared to normal-weight peers, had more cardio-metabolic risk factors and higher risk factors of non-alcohol fatty liver disease and were experiencing more negative psychological outcomes (depression, low self-esteem and lower scores of health-related quality of life). A review carried out by Hoare et al<sup>7</sup> regarding community-based obesity prevention programs revealed positive outcomes in mental health, including moderately reduced anxiety symptoms and increased health-related quality of life. Similarly, Ruotsalainen H et al<sup>26</sup> reported that supervised exercise interventions most affected adolescents' body mass index as well as also positively improves psychological symptoms.

Fotu KF et al<sup>13</sup> found that, one of the measures of quality of life showed a smaller increase in the

adolescents from Tongatapu (intervention group) compared to the less urbanized, outer island of Vava'u (comparison group). The interpretation of this finding is uncertain and a potential explanation may be that adolescents on the main island are exposed to more pressure in terms of achieving high examination results and obtaining employment or overseas tertiary education places. The study conducted by Kremer P et al<sup>14</sup> failed to demonstrate the efficacy of a community capacity-building approach among an adolescent sample drawn whereas studies reporting from a different sociocultural, economic and geographical context in reference to Australian children aged 0–5 years by de Silva-Sanigorski AM et al,<sup>27</sup> another study conducted in Massachusetts by Economos CD et al<sup>28</sup> reported decreased BMI z-score in children at high risk for obesity. In a study by Kaveh Farsani Z et al,<sup>9</sup> relationship between family communication and function, and body image, on one hand, and psychological well-being mediated by depression and self-esteem, on the other hand, among overweight and obese girls and found that family communication and function directly and indirectly (i.e., with the mediation of depression and self-esteem) were correlated with psychological well-being. In addition, although the body image was not directly correlated with psychological well-being, it was correlated with psychological well-being through the mediating variables of depression and self-esteem.

The nature of food, transport and built environments impact on everyday eating and physical activity patterns. As the modernization has replaced traditional healthy foods with less healthy imported foods and carbonated drinks that are high in fat, salt and/or sugar.<sup>13</sup> Moreover, this nutrition transition has been coupled with a rise in sedentary behaviours including increased screen time among youths.<sup>29</sup> Further, to improve the psychological well-being of obese and overweight adolescents, family issues and satisfaction with body image should be taken into account. Although the findings of this study do not indicate causality, they can be used in assisting the psychological well-being of this particular group.<sup>9</sup>

Obesity in childhood and adolescence has different effects on mental health, including symptoms of anxiety, depression, insomnia, social isolation etc., In turn, these conditions would have negative consequences on social relationships and learning issues. In India, we are still struggling with the burden of malnutrition but the issue of over-nutrition cannot be ignored. There is considerable knowledge about the risk factors associated with childhood obesity research and scientific information on the causes and consequences of childhood obesity from developed nations. India should also formulate a national policy and partner with the private sector to end the childhood obesity epidemic.<sup>30</sup>

Obese children experience number of psycho-social problems that significantly affect their quality of life and wellbeing. Co-morbid psychosocial and emotional

problems of obesity generally act as causal or maintaining factors of obesity and thus significantly affect the treatment outcome.<sup>31</sup> There is a prevailing assumption that weight loss interventions are not effective for persons with serious mental illness. Weight loss treatment programs are as effective for persons with serious mental illness as they are for the general population.

Since obesity treatment is a key component in health care, it is important to understand how mental health and obesity treatment, along with weight loss through dieting or surgery, are related. Mental health factors, emotions, behaviors, and social contexts that enhance or hinder weight loss must be taken into consideration.<sup>32</sup>

Our study in accordance with a review conducted by Mehra D et al<sup>33</sup> reported that the multi- constituent school intervention programmes are more productive and plays role in holistic improvement of the overall school environment along with various mental health outcomes. Therefore, school-based programs should be instigated as an entry point for screening mental health problems. However, there is a need for a more comprehensive mental health program in the country for adolescents. Additionally, there is a need to address the gap by conducting more interventions for early and out-of-school adolescents.

## CONCLUSION

The present study found that there is scarcity of research that reports impact of intervention programs on mental health among adolescents. In addition of assessing youth overweight status, mental health related problems must be addressed. As the various studies report association between mental health problems and youth overweight and in developing countries like ours where mental health is ignored among adolescents and most importantly as this group is the future potential of nation, it is crucial that public health programs should target comorbid mental health problems among overweight youth. Furthermore, it is pivotal to identify the suspected co-morbidities, understand the range of individual, social and environmental mechanisms leading to obesity, and help identify policies, interventions and strategies that will change the future trajectory and 'disease burden' in our country.

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