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RESEARCH ARTICLE

OBESITY IN CHILDREN AND ASSOCIATED DISEASES

Mariam Mohammad Al-Rasheedy , Anas Ali A Alzahrani , Yahya Ahmed Almufarrih , Khawla Khamis Alghamdi , Layla Ali Alqozi, Reem Abdulaziz Altaifi , Mohammed Abdullah Alzahrani , Muayyad Fares Alzahrawi , Raghad Adnan Bishnaq , Maha Hamoud Almaghthawi , Khairiah Nasser Alrshedi , Nadiah Mohammadidris Johar , Raad Mohammad Almalki , Zeyad Abdulhaffez Qadah and Fatimah Mohammed Almukharshim

1. Pediatric Consultant Nephrologist, Maternity & Childrens Hospital in Jeddah, P.O.Box 43392 Postal Code 21561 Jeddah, KSA.
2. Family physician , Albaha primary health care center, Albaha ,KSA
3. General physician, KSA.
4. Medical intern, KSA.

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Abstract

Background: Over last few decades, obesity has become a serious point of concern. The prevalence rate is continuously rising both in the developed and developing countries. Obesity not only has phycological effect on the individuals but is also associated with an increased risk of developing range of metabolic, cardiovascular, and liver disorders.

Objective: The objective of the study was to evaluate the prevalence of obesity in children and the type of diseases associated with it.

Methods: A cross-sectional study was conducted in Riyadh, Kingdom of Saudi Arabia between July to September, 2020. The target audience was the parents of children who were overweight.The questionnaire was designed to primarily gather information related to socio-demographic characteristics and correlation of obesity with the diseases. The questionnaire comprised of total number of 14 questions. The responses were recorded and evaluated through the application of scientific algorithms.

Results and Discussions: It was established, that out of the total sample size of 346, around 38% of children were obese and were suffering from associated comorbid diseases, ranging from anxiety, depression, eating disorder, social isolation, lower education attainment, asthma, constipation, flat feet, backpain, Type 1 and 2 diabetes and precocious puberty.

Conclusion: The study presented a worrisome situation of escalating trends of obesity prevalence in children, along with the associated non-communicable diseases. There is need to introduce awareness campaigns along with the measures to promote people to adopt the healthy lifestyles.

Introduction:-

Global Context; Obesity Prevalence:

Corresponding Author:- Dr. Hoda Jehad Abousada
Address:- M.D KFAFH: King Fahd Armed Forces Hospital, Obstetrics and Gynecology, Jeddah, 21159, SA.

The prevalence of obesity is continuing to have an escalating trend in the world. Specially in the last one decade there has been considerable increase in spike in the prevalence rate. With this worrisome trend, today it is considered to be as a pandemic (1) (2).

As per the WHO report, in the year 2016, around 39% of adults aged 18 years and over (39% of men and 40% of women) were overweight. Overall, about 13% of the world's adult population with gender differentials as 11% of men and 15% of women were reported to be obese in 2016. Hence, the worldwide prevalence almost tripled between the span of 31 years, from 1975 to 2016 (3).

The escalating trend, as indicated by the international data is not just limited to the developed countries, but developing countries are equally facing this problem. The predictive modelling informs that by 2030, a major section of the adult population of the world would be either obese or overweight (4)

In most of the countries, where there is increased obesity prevalence rate, the major chunk is of the children. This problem of childhood obesity is worsening at a dramatic rate. Surveys in 1990s show that in countries like Brazil and the USA, additional 0.5% of the entire children population became overweight each year. In other part of the world like Canada, Australia and few European countries, the rates were higher, with an additional 1 % of children population becoming overweight every year (5).

Global epidemiology and pathogenesis review suggest that despite of increased obesity prevalence in every other country of the world, demographic and regional differences prevail, that affects the prevalence trends. These drivers are important to be understood as this helps to provide guidance for the most viable intervention strategies.Few key drivers include the global food system together with sedentary lifestyle (6) (7). Translation of the knowledge of main etiology of increased obesity prevalence into corrective actions remain a challenge. The actions could be on the part of both the people as well as the Governments. Understanding the joint efforts at multi-tier can only help deal with the problem. The Governments may take policy initiatives that facilitate individuals to have choices to cost-effective healthy foodand introduce awareness programs through multiple mediums(8)(9).

Obesity Prevalence in Kingdom of Saudi Arabia:

Like other countries, the obesity prevalence in Kingdom of Saudi Arabia (KSA)has increased over the past few decades. This exposes the population at a greater risk for increased rates of Non-Communicable Diseases (NCDs) morbidity and mortality(10) (11). The combination of factors including Saudi cultural practices and better socio-economic position have contributed to this increased prevalence. These factors provide a conducive environment that promote sedentary lifestyles, unhealth eating and weight gain (12) (13). The studies suggest that obesity and weight gain is more prevalent in Saudi women than men. Hence, this necessitate focusing on the interventions that promote health lifestyles entailing better eating habits and increased physical activity (14).Obesity trends have increased so much in Saudi Arabia that around 7 out of 10 people are facing this problem. This problem prevails both in adults and children. The studies also suggest that both genetics and sedentary lifestyles remained the main reasons of the increased number of people affecting with obesity in KSA (15).

Co-morbidities associated with Obesity:

Not only obesity itself is a menace, but the associated ailments and co-morbidities pose a greater problem for both children and adult populations (16) (17). It has phycological effects on the individuals and is also associated with an increased risk of developing range of metabolic, cardiovascular, and liver disorders (18) (19) (20).

The childhood obesity mainly brings additional problems with it like poor glucose tolerance, hyperinsulinemia, raised risk of type 1 and type 2 diabetes, hypertension, sleep apnea, anxiety, depression, and social isolation. These ailments become more problematic as it gets transitioned into adulthood, increasing the risks for cardiovascular, metabolic and liver disorders (21).Some of the associated ailments include tachycardia, diabetes, gall bladder diseases, endocrine disorders, osteoarthritis and fatty liver. These ailments once diagnosed might require medical treatment that may last for life-times. This would cost to health services, the losses to community and increased burden carried by the individuals (22) (23).

Different management procedures are being undertaken by the worldwide medical practitioners to deal with obesity that include dietary changes, exercise, management through medicines and surgical methods, though its best to control the obesity through life style changes (24) (25).

Material & Methods:-

A cross-sectional study was carried out in Riyadh, Saudi Arabia to see the trends of obesity in children and associated diseases.The data was collected from the low, medium and high-class families of Riyadh. While conducting the surveys, an inclusive approach was adopted, which included surveying the parents of children who were overweight. A total of 346 interviews were conducted during the months of July to September, 2020.

The sample size was determined using OpenEpi open source statistical tool. The margin of error was taken as 5% and the level of confidence as 95%. Since the total population size (N) constituted the estimated prevalent overweight children (0.5%), hence based on the population (N), the total sample size (n) was taken as 346.

The study questionnaire was adapted from various similar studies conducted previously and pre-tested on a sample of more than 500. The questionnaire was designed to primarily gather information related to socio-demographic characteristics and correlation of obesity with the diseases. The questionnaire comprised of total number of 14 questions. The socio-demographic section contained questions mainly related to children age group, their education status, education status of parents, occupation of parents, socio-economic status, and family size. The section of obesity correlation with diseases entailed questioned related to weight and height of children,body shape and associated diseases. The questionnaire contained multiple choice questions, that were mainly closed-ended. For parents' facilitation and better understanding the questions were translated in Arabic as well. The responded took an average time of five minutes to complete the survey.

The questionnaire was designed in google forms and the online link was shared with the parents. An excel file of responses was generated in the google sheet, that was evaluated. The responses were mainly evaluated in term of percentages. Descriptive statistical tests were applied on the data for further validation. These tests were conducted using SPSS Software.

Results:-

The survey results were evaluated using scientific algorithms and calculations. The results were interpreted based on the two major sections of the questionnaire i.e. the demographic indicators and impact of obesity and associated diseases. Based on the data received, question wise analysis was conducted.

The table 1 depicts the summary of responses of the parents of children related to the socio- demographic indicators. This section contained a total of 10 questions out of 14. This constituted the major section of the study to understand the potential drivers for the cause of obesity.

With reference to the responses received, out of the total of 346 parents interviewed, 206 (60%) children were female and 140 (40%) were male, with mean of 173, median (173) and standard deviation (47).

The children ranged between five age groups: less than 1 years of age, 2-3 years, 4-5 years, 6 years and above 6 years. The majority of 40% (138) were above 6 years of age, 10% (35) of 6 years of age and 50% (173) below 6 years of age. As per their age groups about 44% (151) children were having education in grades above kindergarten. The mean was 69, median (61) and standard deviation (42).

As per the age group the children had different education status, some were school going and some were yet to start going to school. To gauge the education level of children the question ranged from not started school, Kindergarten (KG) one, KG two and others. 128 (37%) of children had not started going to school, 40 (12%) were in KG one, 27 (8%) were in KG two and 151 (44%) were in other classes. The mean was 86.5, median (84) and standard deviation (62).

One of the important indicators was to know about the education level of parents, both father and mother. This indicator was assessed to determine the understanding level of parents about the importance of health lifestyle. To determine the education status of parent the questions asked ranged from; no education, primary education,

secondary education, and bachelors. Father results were that only 1% had no education, 6% had primary education, 18% had secondary education and 75% were graduates having bachelor's degree. The mean was 87, median (42) and standard deviation (117). Mother results were that 4% had no education, 6% had primary education, 22% had secondary education and 68% were graduates having bachelor's degree. The mean was 87, median (49) and standard deviation (102).

The working status of parents was also determined. The questions for fathers ranged from private, merchant, government employee, other. 22% served in private sector, 5 % were merchant, 61% were government employee and 12% were in other occupation. The mean was 138, median (77), and standard deviation (138). Similarly, the questions for mothers ranged from house wife, private, merchant, government employee, other. The major portion i.e. 62% were house wives, 8% served in private sector, 2 % were merchant, 23% were government employee and 4% were in other occupation. The mean was 69, median (27), and standard deviation (87).

The study was targeted in three categories of families; low income, medium income and high income. 6% of sample size constituted of low-income group, 81% was medium income group, 12% was high income group. The mean was 115, median (43), and standard deviation (144).

Most of the families reported to have small family size i.e. members less than 5, 52% (180).18% (64) had 5 family members, and 29% (102) had more than 5 family members. The mean was 15, median (102) and standard deviation (59)

The second section was related to obesity and its impact of associated risk of diseases. The Table 2 depicts the summary of BMI calculated based on the children weights in KGs and height in meters.BMI was calculated using formula of m/h2, mass (m) in Kgs and height (in meters).The parents were also inquired about the type of body shape of their child. The respondent's data revealed that around 38% (130) of children were obese and the remaining 62% (216) were overweight. The mean was 231, median (216) and standard deviation (109). Out of total 65% (85) were male and 35% (45) were female. The mean was 65, median (65) and standard deviation (28).

The table 3 summarizes the total number of responses for individual diseases. The interesting results were related to the type of diseases associated with the obesity. The obese children mostly experienced illness like anxiety, depression, eating disorder, social isolation, lower education attainment, asthma, constipation, flat feet, backpain, Type 1 and 2 diabetes and precocious puberty. Around 67% of obese children faced eating disorders eating disorder, while 5% and 2%, respectively suffered from anxiety and depression, 3% social isolation, 2 % Asthma, 2 % Constipation and 1% each Type 2 diabetes, Precocious puberty, Hypertension, Sleep apnea, Gastroesophageal reflex and back pain. The remaining overweight children suffered from Anxiety (1%), Depression (15), Eating Disorders (64%), Social Isolation (1%), Type 1 and Type 2 diabetes (1%), Asthma (4%), Constipation (2%) and others (20%).

Discussion:-

The study of socio-demographic indicators revealed interesting facts. Around 89% of children ranged from the age limits of 2 years or more, while 11% were below 1 years of age. The survey mainly targeted young children as there is greater probability of obesity to get transferred from childhood to adulthood. At the younger age it is easy to control the obesity issue by adopting health diet full of fruits, milk, grains, fulfilling the nutritional requirements, yet not contributing to fat retention in the adipose tissues of the body.

The study showed that 63% of the children were acquiring education, with 37% having not started their school. That suggests that most of the children were going to school and had at least one time of their meal there. That could be related that they were getting counselling from their teachers as well as on good eating habits. This shows that because children are usually fond of junk food, they preferred that, thus not going for health food habits like fruits, milk etc.

With respect to the education status of parents, around 75% (258) fathers and 68% (234) mothers were well educated holding the minimum of Bachelor's degree. While only 1% (5) of fathers and 4% (14) of mothers had no education. This showed that looking at the overall trend, parents had good understanding of obesity, its cause and potential complications. The unfortunate reality was that even though parents were aware of the importance of healthy lifestyle, and balanced diet, their children were facing these issues.

The patents occupation trend was also studied and it showed that all the fathers were busy in their offices/ businesses, while, 62% of mothers were housewives. That shows that majority of the mothers had good time to prepare health food for their children going to schools and could do counselling of their children about the importance of health diet and prepare healthy food for them according to their likings.

A considerable segment, 81% (281) families were from middle class, whereas, only 6% (22) and 12% (43) had low and high socio-economic status. Therefore, only 6% of the facilities were low income and 94% had good earnings and socio-economic status.

Hence, despite of good socio-economic environment, good education level and understanding of the problem, unfortunately most of the children were obese. This can also be inferenced that probably parents need to be apprised on the importance of health life style, problems associated with obesity and expensive medicine and surgical treatments that can be both painful and burden on the economic status.

With respect to the analysis of the BMI and the associated risks of obesity on the children, it was found that 38% of the children were obese. The obese children mainly suffered from the ailments related to mental disorders, metabolic disorders, and eating disorders. The mental disorders include anxiety and depression. This had a negative impact on the child psychological health and in turn contributed to social isolation, shattered confidence of children and low concentration to education. There is a possibility that such children may not regain their confidence in the crucial personality development stage of their lives, thus having lifelong effects on their personalities.

Themetabolic disorders included Type 1 and 2 diabetes, which led to other associated problems like increased urination, increase thirst, and weakness. These metabolic disorders are usually irreversible and if not dealt timely through life-style changes require medicine to be used for the whole life.

As per the survey, most of the obese children faced eating disorders in the form of indigestion constipations and stomach problems. These disorders occur when there is less protein and vitamin intake and more consumption of fats and carbohydrates. With taking healthy diet these disorders can be averted.

Some of the associated diseases could be addressed through adopting lifestyle changes like exercise and health diet, however, some of the disorders necessitated medical treatment that might have to be continues life-time. The study thus summarizes that the problem of obesity exists in children and needs to be addressed at both the individual and Government level. People need to be educated about obesity and health lifestyles. This could be achieved through mediums such as print media, television advertisements and social media etc. The Government can launch such awareness programs which would not only increase their cognizance levels about the diseases but also facilitate people with healthy diet plans.

Conclusion:-

The growing number of obese children on KSA is a great concern. It was established in the study that most of the families were well educated and had good socio -economicstatus. Despite this factor, around 38% of children were obese and suffered from the related diseases including anxiety, depression, eating disorder, social isolation, lower education attainment, asthma, constipation, flat feet, backpain, Type 1 and 2 diabetes and precocious puberty. The findings serve as an eye-opener and necessitates the policy makers to take measures to control the obesity increasing prevalence rates. Awareness campaigns need to be introduced along with the measures to promote people to adopt the healthy lifestyles.

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Declaration of participant consent

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Conflict of Interest
There is no conflict of interest.

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Appendix: Tables

Table 1:- Socio-demographic indicators.

	No. of Observations	Percentage	Mean	Median	SD
Sex of Child					
Male	206	60%			
Female	140	40%			
Total	**346**	**100%**	**173**	**173**	**47**
Age by year					
Less than 1	38	11%			
2-3years	74	21%			
4-5 years	61	18%			
6 years	35	10%			
Above 6 years	138	40%			
Total	**346**	**100%**	**69.2**	**61**	**42**
Education status of children					
Not started school	128	37%			
KG one	40	12%			
KG two	27	8%			
Others	151	44%			
Total	**346**	**100%**	**86.5**	**84**	**62**
Education status of mother					
No education	14	4%			
Primary education	22	6%			
Secondary education	76	22%			
Bachelor	234	68%			
Total	**346**	**100%**	**86.5**	**49**	**102**
Education status of father					
No education	5	1%			
Primary education	20	6%			
Secondary education	63	18%			
Bachelor	258	75%			
Total	**346**	**100%**	**87**	**42**	**117**
Father Occupation					
Private	77	22%			
Merchant	17	5%			
Government Employee	211	61%			
Other	41	12%			
Total	**346**	**100%**	**138**	**77**	**138**
Mother Occupation					
House wife	216	62%			
Private	27	8%			
Merchant	7	2%			
Government employee	81	23%			
Other	15	4%			
Total	**346**	**100%**	**69**	**27**	**87**
Socioeconomic status					
Low	22	6%			
Medium	281	81%			
High	43	12%			
Total	**346**	**100%**	**115**	**43**	**144**
Family size					
Less than 5	180	52%			
5 in number	64	18%			

More than 5	102	29%			
Total	**346**	**100%**	**115**	**102**	**59**

Table 2:- BMI.

	No. of Observations	**Percentage**	**Mean**	**Median**	**SD**
BMI					
Obese	130	38%			
Others	216	62%			
Total	**346**	**100%**	**231**	**216**	**109**
Male (Obese)	85	65%			
Female (Obese)	45	35%			
Total	**130**	**100%**	**65**	**65**	**28**

Table 3:- Associated diseases in overweight children.

Associated Ailments	**Child illness (obese)**	**Child illness (others)**	**Percentage (obese)**	**Percentage (others)**
Anxiety	6	3	5%	1%
Depression	2	2	2%	1%
Eating Disorders	87	138	67%	64%
Social isolation	4	3	3%	1%
Lower educational attainment	1	7	1%	3%
Type 1 diabetes	0	2	0%	1%
Type 2 diabetes	1	0	1%	0%
Precocious puberty	1	1	1%	0%
Hypertension	1	0	1%	0%
Sleep apnea	1	0	1%	0%
Asthma	3	8	2%	4%
Gastroesophageal reflex	1	1	1%	0%
Constipation	2	5	2%	2%
Flat feet	2	1	2%	0%
Back pain	1	0	1%	0%
Forearm fracture	0	1	0%	0%
Others	17	44	13%	20%
Total	130	216	100%	100%