Covering Letter

To,

The Editor

Sub: Submission of Manuscript for publication

Dear Sir,

I intend to publish an article entitled **" Prevalence and Factors Associated with Obesity and Overweight among Children under- 2 Registered Health Care Centers in Jeddah, Saudi Arabia, 2015) "** in your esteemed journal as an Original Article.

I will act and guarantor and will correspond with the journal from this point onward.

The article was not published or under consideration, in part or whole, simultaneously in any other journal or proceedings.

The authors have no funding to disclose.

Conflicts of interest The authors declare no conflict of interest with the content of this manuscript

Permissions The authors declare no permission for reproducing pre-published information/material.

I hereby transfer, assign, or otherwise convey all copyright ownership, including any and all rights incidental thereto, exclusively to the journal, in the event that such work is published by the journal.

We would like to suggest following referees for the article.

Thanking you,

Yours' sincerely,
Sultan abdulrahman Alamri

Corresponding contributor:
Sultan abdulrahman Alamri1

Family Medicine Doctor, Ministry of health, Jeddah, Saudi Arabia

Email: drsala6@hotmail.com

Mobile: 00966541168867

Prevalence and Factors Associated with Obesity and Overweight among Children under- 2 Registered Health Care Centers in Jeddah, Saudi Arabia, 2015

Sultan abdulrahman Alamri[1] And Imran Siddiq[1]

1: Family Medicine Doctor, Ministry of health, Jeddah, Saudi Arabia

Cross ponding Author:

Sultan abdulrahman Alamri1

Family Medicine Doctor, Ministry of health, Jeddah, Saudi Arabia

Email: drsala6@hotmail.com

Mobile: 00966541168867

ACKNOWLEDGMENTS

Praise be to Allah that His grace is righteous,

This work is dedicated to my wife and my beloved kids for their support and encouragement, and the many friends who support me on this journey, thank you

I would like to express my deepest gratitude to my supervisor Dr. Muneera Balahmar for her unwavering support and mentorship throughout this project.

I would like to extend my thanks to the joint program of family medicine trainers and administration, to the staff of the PHCCs for their cooperation and Dr. Adel Ibrahim for his support and precious advice.

ABSTRACT

Background

Childhood obesity and overweight are becoming a concern for public health worldwide since decades. In 2013, approximately 42 millions of children under the age of 5 years are either obese or overweight. The aim of the study is to highlight the need for early detection and preventive program

Method

This cross-sectional study was conducted in 2 CBAHI approved primary health care centers, in the ministry of health, Jeddah, Saudi Arabia, during 2015, among children two years and younger, using a checklist.

Result

280 children participated in the study of which 146 (52.1%) were female, and 134 (47.9%) were male .The prevalence of obesity and overweight was(1.0 and 5.5) respectively. 126 (45.0%) depend on mixed methods on feeding, 108 (38.6%) depend on breastfeeding & 46 (16.4%) depend on bottle feeding. The mean scores for the age of weaning were 5.4±0.8 for the age of weaning. There was a significant association between BMI category and both family history of obesity & child of a diabetic mother ($p<0.001$,$p=0.04$).

Conclusion

This study highlighted the problem of obesity and the rate of spread of the children in Jeddah, and also identified some of the risk factors associated with this phenomenon, where the study showed a strong association between family history of obesity (at least one of the parents is obese), diabetic mother and obese child. Further studies need to be conducted to investigate the relations between an obese child and other risk factors.

1- INTRODUCTION

1.1 BACKGROUND

Childhood obesity and overweight are becoming a concern for public health worldwide since decades. According to World Health Organization (WHO), approximately 42 millions of children under the age of 5 years, are either obese or overweight in 2013.[1] The prevalence of obesity (defined as a Body Mass Index [BMI] >97th percentile) and overweight (defined as a [BMI] >85th percentile) among children increased, so did the prevalence of associated comorbidities. Researchers efforts all over the world had been devoted to identifying the prevalence and factors related to this problem.

The risk of cardiovascular morbidities and mortalities in adulthood are increasing in obese children.[2] Obesity in children also found to be positively correlated with risk of having impaired fasting glucose in childhood and adolescence,[3] along with low self-esteem and depression in the adolescence and adulthood. Obese children with decreasing levels of self-esteem demonstrate significantly higher rates of sadness, loneliness, and nervousness and are more likely to engage in high-risk behaviors such as consuming alcohol. [4]

There is a particular focus on infancy (i.e., 0-3 years) as a critical period in obesity development, because excess fat early in life has both immediate and long term health consequences. [5] In the short term, obese children show pulmonary, gastroenterological, orthopedic and endocrine complications. [6-9] Persistence of these complications into adolescence and adulthood is common, and the long-term consequences for morbidity and mortality are well recognized. [9]

The prevalence of obesity and overweight in childhood is affected by several factors (genetic, environmental, socioeconomic, behavioral and nutritional). [10-12]

Obesity and overweight have increased more dramatically in economically developed countries and urbanized populations.[13] In the United States of America, the prevalence of obesity and overweight in children aged 2 to 19 Years old was 11.3% and 31.9% respectively in the period of 2003 to 2006. [14] In the Gulf countries, the prevalence of obesity is increasing as demonstrated by studies in Kuwait,[15] Emirates ,[16] and Saudi Arabia. [17]

A sufficient understanding of the magnitude of obesity and overweight among under-2 children is needed, especially that 0-2 years of age is considered as a critical period in obesity development. personal interest of researcher at obesity in children. Up to the knowledge of the researcher, the problem had not yet been investigated in Jeddah at this age group

This study aimed to highlight the need for early detection and preventive programs for under 2 years old children. To measure the prevalence of Obesity and Overweight among Children under 2 registered in Well Baby Clinic in two CBAHI accredited Primary Health Care Centers in Jeddah, Saudi Arabia, 2015.To identify the factors associated with Obesity and Overweight among those Children.

2. METHADOLOGY

This was a cross-sectional study conducted among all children(280) under 2 years of age who were registered in the well-baby clinic children of two CBAHI accredited PHCCs in Jeddah (Al- hamra & Al- mahjar PHCCs).

This study had been conducted in two CBAHI accredited primary health care centers (Alhamra PHCC and Almahjar PHCC), in the ministry of health, Jeddah, Saudi Arabia. The Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI) is an official agency authorized to grant accreditation certificates to all the governmental and private healthcare facilities operating today in Saudi Arabia. It has emerged from the Saudi Health Council as a non-profit organization. CBAHI accreditation was established to measure the competency of the facility and health worker to insure that the resources, process, and outcome of care meet the need and expectation of internal customer (employee) and external customer (patient and visitor), and to maintain the safety of the health process and the environment.[30]

The rational for conducting this study in the well-baby clinics of these two CBAHI accredited PHCCs; is the proper documentation and accuracy of measurement of growth parameters and calibration of equipment by trained nurses according to standardized policies and procedures of MOH.

Inclusion criteria

All Children aged two months old (as this is the age when children start vaccination appointment in primary health care center) to 2 years old, both boys and girls, Saudis and non-Saudis.

Exclusion criteria

All children above two years old.

3.5 Data Collection Tool

The tools for data collection for this study were:

1- A check list [formulated by researcher after reviewing the articles of similar studies, which covered the demographic, socioeconomic and nutritional aspects of the children and their parents.

1- WHO gender and age-specific weight for height Z score growth charts [**appendix2 and 3**]. The use of *Z* -scores is recommended for several reasons: First, *Z* -scores are calculated based on the distribution of the reference population (both the mean and the standard deviation [SD]); thus, they reflect the reference distribution. Second, as standardized measures, *Z* -scores are comparable across age, sex and measure. Third, *Z* -scores can be analyzed as a continuous variable and it is the best to use in researches . In addition, *Z* -score values can quantify the growth status of children outside of the percentile ranges. [31

The researcher obtained the anthropometric measurements, and risk factors that had been documented at the well-baby clinic files of the target population included in the study. Z score was obtained through the weight/ length age specific growth charts according to WHO standards. And filled the pre-set check list by reviewing the files of included children. Anthropometric measures (weight and height) of the last visit (previously plotted by primary health care staff) were obtained and plotted by the

researcher on the proper WHO gender and age-specific weight for height Z score growth charts. Parents were contacted by phone for any missing data.

STUDY VARIABLES:

Dependent variables:

Obesity and Overweight.

Independent variables:

Gender, Age, Family income, Socioeconomic status, Mother (job, education and age), Nutritional status of child, Family history of obesity, and Diabetes in mother.

Data Entry and Analysis

This was done by (**SPSS**) statistical program for social sciences version (20). Results were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and median and Inter Quartile Range (IQR) for non normally distributed quantitative variables. To test statistical significance for the categorical variables; Chi square was used when applicable (<20% of cells with expected count <5, and no even one cell with expected count <1), otherwise, Fisher Exact test was used instead. Statistical significance was considered at P-value <0.05 and Confidence interval of (95%).

All necessity ethical approvals were obtained (The ethical committee in JPFCM, the research committee in the ministry of health in Jeddah, and the approval from the administration of targeted primary health care centers) .

This study was self-funded.

Result

4.1 Characteristics of the children

4.1.1 Socio-demographic characteristics of the children

As shown in **[Table 1]** almost all examined children were Saudis (98.2%) with slight predominance of females (52.1%). Two thirds of the children had mothers with secondary level of education and below(66.4%) in addition to 31.1% whom their mothers had university qualification, and few minorities of them had elementary education and below (2.5%). Regarding fathers, almost one half of children had fathers who have university qualifications (49.6%), and as is the case of mothers, only few minorities had elementary level of education (2.1%). Accordingly, the overwhelming majority of the mothers (86.8%) were not currently working, whereas almost all fathers had current jobs or retired (95.3%). The average number of siblings for the investigated children was two siblings with Interquartile Range IQR (2-4), therefore, the median for the order of the examined children among their siblings was the third order with IQR (2-4).

Most of the children (95.4%) were living in flats, and few minorities (4.6%) were living in villas. The great majority of the families with whom the children were living had monthly income ranging between 5,000-20,000 SR (77.8%); out of them there were 43.2% who had monthly income ranging between 10,000 to 20,000 SR **[Table 2].**

The great majority of the surveyed children (95.7%) were full term at delivery and only 12 (4.3%) who were preterm, slightly more than one third (38.6%) were exclusively breast fed, while 46 (16.4%) were bottle fed and the rest had mixed breast and bottle feeding. Only 27 (10.5%) of the children had been subjected to weaning at the age of 4 months and the majority started weaning either at 5 months (44.7%) or 6 months of age (40.1%) **[Table 3]**. The most commonly introduced food for weaning were vegetables, fruits, rice and cerelac either in one or mix of these food items.

Table 1: Demographic characteristics of the children 2 years and younger in 2 PHCC in Jeddah (n=280), 2015.

Characteristics	No.	%
Nationality:		
Saudi	275	98.2
Non Saudi	5	1.8
Gender:		
Male	134	47.9
Female	146	52.1
Education level of the mother:		
Elementary	7	2.5
Secondary	186	66.4
University	87	31.1
Education level of the father:		
Elementary	6	2.1
Secondary	135	48.2
University	139	49.6
Working status of the father:		
Working	267	95.3
Not working	13	4.7
Working status of the mother:		
Working	37	13.2
Not working	243	86.8
Number of siblings:		
One	69	24.6
Two	72	25.7
Three	49	17.5
Four	51	18.2
Five or more	39	13.9
Median (IQR)	2(2-4)	
Birth order of the child:		
First	64	22.9
Second	74	26.4

Third	55	19.6
Fourth	46	16.4
Fifth or more	41	14.6
Median (IQR)	3(2-4)	

Table 2: Characteristics reflecting socioeconomic status of families of children 2 years and younger in 2 PHCC in Jeddah (n=280), 2015.

Type of housing and monthly income	No.	%
Type of housing:		
Villa	13	4.6
Flat	267	95.4
Monthly income of the family:		
<5,000 SR	20	7.1
5,000-<10,000 SR	97	34.6
10,000-20,000 SR	121	43.2
>20,000 SR	42	15.1

Table 3: Maturity at delivery and nutritional history of the children 2 years and younger in 2 PHCC in Jeddah, 2015

Delivery and nutritional history	No.	%
Maturity at delivery:		
Full term	268	95.7
Preterm	12	4.3
Type of feeding:		
Breast fed	108	38.6
Bottle fed	46	16.4
Mixed breast and bottle fed	126	45.0
Age of starting weaning (n=257):		
4 months	27	10.5
5 months	115	44.7

6 months	103	40.1
7 months or older	12	4.7

4.1.2 Comorbidities and relevant familial factors potentiating obesity among children

Table 4 demonstrates that 18 (6.4%) of the children had positive family history of obesity, most of them 11(61.1%) were from the father side. Six children (2.1%) had diabetic mother, and 12 (4.3%) had mothers with other comorbidities such as bronchial asthma, hypertension, hypothyroidism and anemia. Only 5 (1.8%) of the children had smoker mothers.

Table 4: Familial factors and comorbidities relevant to possibility of obesity among the children 2 years and younger in 2 PHCC in Jeddah, 2015.

Familial factors and comorbidities	No.	%
Family history of obesity:		
No	262	93.6
Yes	18	6.4
Consanguinity of the obese relative (n=18)		
Father or relative to the father	11	61.1
Mother or relative to the mother	7	38.9
Maternal diabetes mellitus:		
Yes	6	2.1
No	274	97.9
Other maternal comorbidities:		
Yes	12	4.3
No	268	95.7
Smoking status of the mother:		
Smoker	5	1.8
Non smoker	275	98.2

4.2 Body mass of the children and factors possibly affecting it

According to the categories of the body mass of the children standardized by age, **Figure 1** shows that the majority of the children 271 (93.4%) were within the normal body mass with an average of $\pm$ 2Z scores, and 16 (5.5%) were overweight with an a range between +2Z and +3Z scores, and the rest 3(1.0%) were obese with Z score >3.

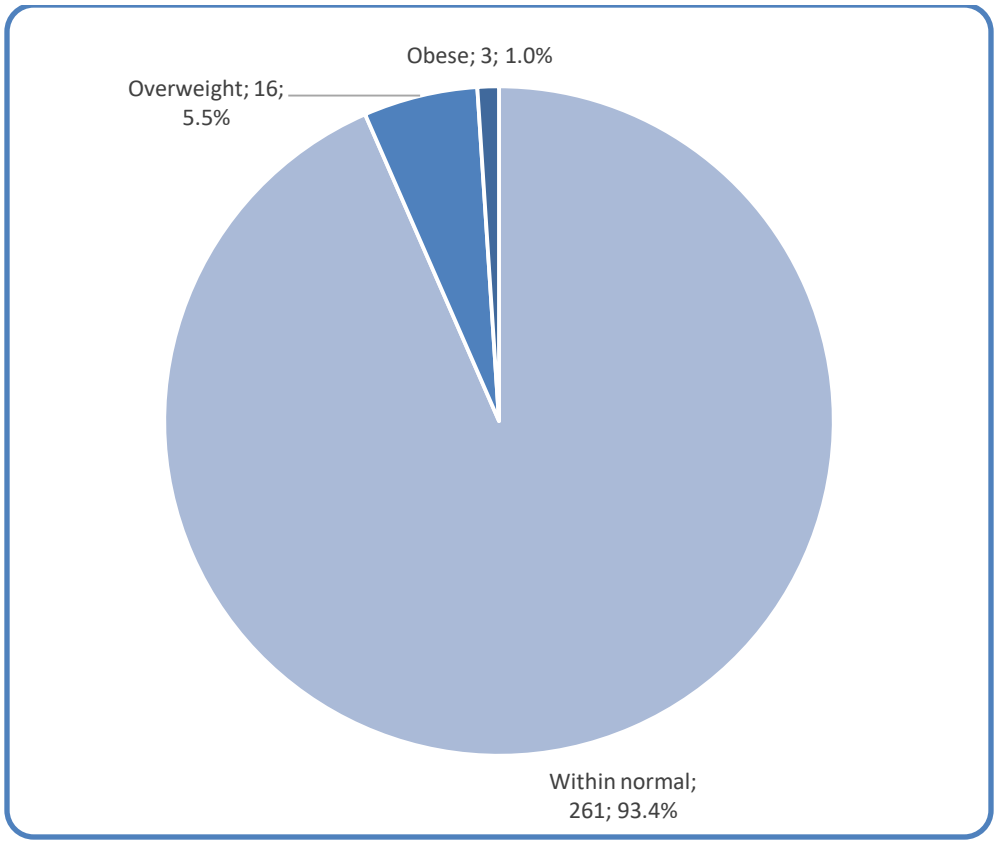

Figure 1: Body Mass Index of the children standardized by age in children 2 years and younger in 2 PHCC in Jeddah, 2015

4.2.1 Differences in body mass of the children according to sociodemographic characteristics.

Due to small number of obese children (n=3) and to facilitate comparison of the differences in the body mass of the children according to their characteristics, the obese and overweight were collapsed into one group. **Table 5** shows that although obesity/overweight was higher among Saudi and male children, however, this difference was not statistically significant p>0.05.

Despite the likelihood of Obesity/overweight was found to be increasing with higher educational level of the parents, among children with non working mothers, and among children whom fathers are working, these differences were also not statistically significant p>0.05. Regarding number of siblings and order of the surveyed children within their siblings, the table demonstrates that the frequency of obesity/overweight was apparently more frequent among children with more number of siblings, with a rate

reaching to up to 9.8% in children who have four siblings compared to 5.8% among children who have only one sibling. Accordingly, it was observed that the frequency of obesity/overweight was higher in children with higher birth order, reaching up to 8.7% among children who came fourth in their siblings compared to 5.4% in those who were second and 6.2% when being the first.

On the same context, it was remarked that there was no statistically significant difference in body mass of the children according to whether they are living in villa or flat p>0.05. Regarding the monthly income, **Table 6** shows that the higher is the monthly income of the family the more likely the children will be obese/overweight, while no obesity/overweight was detected among children living in families with monthly income <5,000 SR, the rate was 7.2% among children within families with monthly income ranging between 5,000 to 10,000 SR which reached up to 9.5% in infants with family income >20,000 SR. However, these differences were not statistically significant p>0.05.

Table 5 : Differences in body mass of the children 2 years and younger according to their demographic characteristics in 2 PHCCs in Jeddah, 2015

Characteristics	Body mass				X^2	P*
	Obese/ overweight		Within normal			
	No	%	No	%		
Nationality:						
Saudi	18	6.5%	257	93.5%		
Non Saudi	1	20.0%	4	80.0%	Fisher	0.298
Gender:						
Male	12	9.0%	122	91.0%		
Female	7	4.8%	139	95.2%	1.912	0.167
Education level of the mother:						
Elementary	0	0.0%	7	100.0%		
Secondary	9	4.8%	177	95.2%	4.674	0.097
University	10	11.5%	77	88.5%		
Education level of the father:						
Elementary	0	0.0%	6	100.0%		

Secondary	6	4.4%	129	95.6%	3.055	0.217
University	13	9.4%	126	90.6%		
Working status of the father:						
Working	18	6.6%	254	93.4%		
Not working	1	12.5%	7	87.5%	Fisher	0.434
Working status of the mother:						
Working	4	10.8%	33	89.2%		
Not working	15	6.2%	228	93.8%	Fisher	0.293
Number of siblings:						
One	4	5.8%	65	94.2%		
Two	4	5.6%	68	94.4%		
Three	3	6.1%	46	93.9%	NA	NA
Four	5	9.8%	46	90.2%		
Five or more	3	7.7%	36	92.3%		
Birth order of the child:						
First	4	6.2%	60	93.8%		
Second	4	5.4%	70	94.6%		
Third	4	7.3%	51	92.7%	NA	NA
Fourth	4	8.7%	42	91.3%		
Fifth or more	3	7.3%	38	92.7%		

Table 6: Differences in body mass of the children 2 years and younger according to characteristics reflecting socioeconomic status of the family in 2 PHCC in Jeddah, 2015.

Characteristics	Body mass				X^2	P*
	Obese/ overweight		Within normal			
	No	%	No	%		
Type of housing:						
Villa	1	7.7%	12	92.3%		
Flat	18	6.7%	249	93.3%	Fisher	0.607
Monthly income of the family:						
<5,000 SR	0	0.0%	20	100.0%		

5,000-<10,000 SR	7	7.2%	90	92.8%	1.988	0.575
10,000-20,000 SR	8	6.6%	113	93.4%		
>20,000 SR	4	9.5%	38	90.5%		

* Based on Chi square

4.2.2 Differences in body mass of the children according to nutritional history and familial comorbidities.

Although obesity/overweight was more frequent among children delivered full term (7.1%) than the preterm, however, this difference was not statistically significant p>0.05. The frequency of obesity/overweight was significantly higher among children who were either breast fed (10.9%) or mixed breast and bottle fed (9.5%) if compared to exclusively bottle fed (1.9%) p<0.05. Meanwhile, the highest frequency was remarked among children among whom the weaning was started at seven months of age or older (25%) **[Table 7b]**.

One half of the children born in families with positive family history of obesity (50%) were obese/overweight compared to only 3.8% of children with negative family history; this differences is statistically significant p<0.05. Also it was remarked that obesity/overweight was remarkably higher in children with diabetic mothers (33.3%) than those with non diabetic, with a borderline significance at p=0.05 **[Table 8]**.

Also, the frequency of obesity/overweight was higher among children whom their mothers were smokers than the non smokers (20% vs 6.5%), however, this difference is not statistically significant p>0.05.

Table 7: Differences in body mass of the children 2 years and younger, according to maturity at delivery and nutritional history.

Characteristics	Body mass				X^2	P*
	Obese/ overweight		Within normal			
	No	%	No	%		
Maturity at delivery:						
Full term	19	7.1%	249	92.9%		
Preterm	0	0.0%	12	100.0%	Fisher	0.423
Type of feeding:						
Breast fed	5	10.9%	41	89.1%		
Bottle fed	2	1.9%	106	98.1%		
Mixed breast and bottle fed	12	9.5%	114	90.5%	6.863	0.032
Age of starting weaning (n=257):						
4 months	6	22.2%	21	77.8%		
5 months	3	2.6%	112	97.4%		
6 months	5	4.9%	98	95.1%	NA	NA
7 months or older	3	25.0%	9	75.0%		

* Based on Chi square

Table 8: Differences in body mass of the children 2 years and younger according to familial comorbidities and relevant factors.

Characteristics	Body mass				X^2	P*
	Obese/ overweight		Within normal			
	No	%	No	%		
Family history of obesity:						
Yes	9	50.0%	9	50.0%		
No	10	3.8%	252	96.2%	56.794	<0.001
Diabetic mother:						
Yes	2	33.3%	4	66.7%		
No	17	6.2%	257	93.8%	Fisher	0.050
Smoking status of the mother:						
Smoker	1	20.0%	4	80.0%		
Non smoker	18	6.5%	257	93.5%	Fisher	0.298

* Based on Chi square

4- DISCUSSION

Around the world overweight and obesity became a real public health problem either in developing countries or developed ones.[32]

The aim of the current study was to determine the frequency of overweight/obesity in children two years and less, and factors associated with an increased risk of this health problem.

The results of our study showed that the frequency of overweight and obesity among children aged 0-2 years was (5.5%) and (1.0%) respectively. This is considered low compared to the findings of the study conducted in China, which concluded that the prevalence of overweight and obesity among 2 years old children was 14.38% and 10.11%, respectively, [27] and in Brazil, where 15.6% of children at 72 months of age, were overweight and 12.9% were obese.[11] In contrast, the prevalence of overweight and obesity among children aged 0–59 months in Sub-Sharan Africa was 3.9% and 2.9% respectively. [28] In the central region of Saudi Arabia, the prevalence of obesity and overweight among children 2-6 years was (7.5%, 15.9 %) and in Southwest was (2.9%, 8.2%) respectively.[17] These variations are most probably due to the geographic and socioeconomic variations in this vulnerable group of children. In this respect, we cannot exclude the possible effect of small sample size in our study on the obtained results, relevant to that in the above mentioned studies.

In the current study, The frequency of obesity/overweight was significantly higher among infants who were breastfed (10.9%) or mixed breast and bottle fed (9.5%) if compared to exclusive bottle fed (1.9%). This might be explained by the fact that bottle fed infants are more prone to infections and gastroenteritis which may affect their growth and body weights dramatically. The association between BMI categories and the type of milk feeding may be affected by the frequency, the amount of total feeding per day and the introduction of solid food. To determine the association may need a prospective study with larger sample size.

Several studies had been conducted to investigate the relation between the nutritional history of infants and overweight/obesity problem. In a review of the literature; a randomized control trial was done by Weber et al., found that a high protein intake during the first 12 months of life, increase the risk of developing obesity later in school age by 2.43 times. [26] In China study, the authors estimated the risk of developing obesity in infants fed on formula milk by 30-35% at the age of 2 years. [27] a similar

result found in the study conducted in the USA about the determinants of obesity, where the authors stated that the risk of developing obesity among children who breastfed was less than children who fed formula milk. ([33])

There was no significant association between age of weaning and BMI categories in this study, In USA study the authors reported that the longer duration of breastfeeding was lowering the risk of obesity. [(33)] Likewise, in the cohort study conducted in Iceland, the authors reported that infants who fed on formula and started to have a solid food by the 5th month of life; showed a rapid growth and weight gain in the first 12 months of life at a higher rate than in breastfeeding infants. which put them in the risk zone of developing obesity in the school age and adolescence.[(25)]

Regarding the family history of obesity, the current study results showed that there was a strong association between family history of obesity and obese children ($p<0.001$). Similar results were found in other studies: In the USA study, the authors reported that children aged seven years for obese parents have the tendency to be obese more than the children of the same age for normal weight parents.[(33)] Also, the study in Brazil found that one-third (56-30.8%) of overweight children had obese parents. [(11)] Moreover, similar results were also found in studies conducted in sub-Sharan Africa region, Iran & China. [(28,29, 27)]

This association could be mostly due to shared genetic backgrounds between parents and their offspring, but it could also be related to parents' different concepts regarding child growth and feeding, as well as the actual feeding behaviors given their own BMI status.

The current study showed that there was a strong association between diabetic mother and development of obesity in the children ($p=0.050$).

Regarding the pregnancy outcomes and child order among sibling, the result of the current study showed no significant association between these variables and BMI index. in contrast to the other studies done in Brazil, where the authors of the two studies reported a significant association between pregnancy outcomes and children BMI. they report that caesarean section is common between obese & overweight mothers and one of its effects is the decreasing of breastfeeding chance during the first hour of life. which increased the opportunities for child to be obese more than normal delivery, also the high weight of birth increases the chances of the children to be obese, [(11,12)] and in Iran study, there was a significant association between the order of children (more than 3) and high BMI index. [(29)]

Both demographic and socioeconomic factors had noticeable effects on developing obesity in school age and adult age . the current study showed no significant association between demographic and socioeconomic and children BMI, other studies confirmed the existence of this association and others didn't confirm the relation , regarding gender factor no significant difference was found in this study , similar to that Iran study, [29] while in Sub Sharan Africa region & China studies, the prevalence of obesity was more in boys than girls . [28,27]

Concerning Parents education, no association was found in this study between level of education and children obesity , a similar result was found in China study, [27] while in Iran study there was no relation between mothers education and children obesity while there was a negative association between high level of education for fathers and children obesity. [29] In the two studies from Brazil, the results showed negative association between parental education and children obesity where the high level of education works as a preventing factor against obesity. [11,12]

Regarding monthly income and mother working variables the results of the current study showed no significant association between monthly income and children obesity , in Brazil study 2014 the authors reported high monthly income as a risk factor while in Brazil study 2015 the authors reported the prevention effect of high monthly income on developing obesity , and at the same time reported mother working as a risk factor for developing obesity. [11]

Limitations

- A limitation of time and resources was considered.
- Relatively small sample size.
- recall and selection bias was considered

5- CONCLUSION

The frequency rate of obesity/overweight in children two years old and younger in Jeddah, was found to be 1.0% and 5.5% respectively. This study also identified some of the risk factors associated with this phenomenon. It showed a strong association between family history of obesity (at least one of the parents is obese), diabetic mother and obese child. also showed a strong association between the nutritional history, type of milk feeding during infancy and obese child.

The researchers recommended the following; Further studies need to be conducted to review the relation between the obese child and other risk factors such as parent education, monthly family income, pregnancy outcomes and nutritional history, especially that is related to breast feeding, to decide the most suitable intervention programs to reduce the incidence of this problem. Further studies need to be conducted on a bigger population to assess the prevalence of obesity among children in Jeddah & to investigate the association risk factors. An educational program needs to be designed and implemented in a simple & easy language among all family members, caregivers and those who involved in child and parents education to increase the level of awareness about this problem and to adopt appropriate practice guidelines towards the child's health and nutrition. Using the media to spread the importance of knowledge about the obesity problem is indicated. Use pediatric clinics & vaccination appointment to educate the mother about the maternal obesity and the good control for blood sugar for those who are diabetic. Work on designing plans & strategies to set up a special program for the early detection of obesity among children who attend well baby clinic. A need for implenting an educational materials directed to students at school and in the university about the risk of obesity and its consequences on health .

6- REFERENCES

1. Global Strategy on Diet, Physical Activity and Health. Childhood overweight and obesity. WHO 2016. http://www.who.int/dietphysicalactivity/childhood/en/

2. Cote AT, Harris KC, Panagiotopoulos C, Sandor GG, Devlin AM. Childhood obesity and cardiovascular dysfunction. Journal of the American College of Cardiology. 2013;62(15):1309-19.

3. Hagman E, Reinehr T, Kowalski J, Ekbom A, Marcus C, Holl RW. Impaired fasting glucose prevalence in two nationwide cohorts of obese children and adolescents. International journal of obesity. 2014;38(1):40-5.

4. Strauss RS. Childhood obesity and self-esteem. Pediatrics. 2000 Jan;105(1):e15.

5. Hawley NL, Johnson W, Nu'usolia O, McGarvey ST. The contribution of feeding mode to obesogenic growth trajectories in American Samoan infants. Pediatr Obes. 2014 Feb;9(1):e1-e13.

6. Daniels SR. The consequences of childhood overweight and obesity. Future Child. 2006 Spring;16(1):47-67.

7. Madison LD, Armsby LR, Boston BA. Chapter 9: Obesity, Metabolic Syndrome, and Dyslipidemia in: Pediatric Practice Endocrinology, 2ed. Copyright © 2014 by McGraw-Hill Education.

8. Mafort TT, Rufino R, Costa CH, Lopes AJ. Obesity: systemic and pulmonary complications, biochemical abnormalities, and impairment of lung function. Multidiscip Respir Med. 2016; 11: 28.

9. Güngör NK. Overweight and Obesity in Children and Adolescents. J Clin Res Pediatr Endocrinol. 2014 Sep; 6(3): 129–143.

10. Al Alwan I, Al Fattani A, Longford N. The effect of parental socioeconomic class on children's body mass indices. Journal of clinical research in pediatric endocrinology. 2013;5(2):110-5.

11. Portela DS, Vieira TO, Matos SM, de Oliveira NF, Vieira GO. Maternal obesity, environmental factors, cesarean delivery and breastfeeding as determinants of overweight and obesity in children: results from a cohort. BMC Pregnancy Childbirth. 2015; 15 (94).

12. Moreira MA, Cabral CC, Ferreira H Da S, de Lira PIC. Prevalence and factors associated with overweight and obesity in children under five in Alagoas, Northeast of Brazil; a population-based study. Nutr Hosp. 2014; 29(6):1320-6.

13. Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. International journal of pediatric obesity : IJPO : an official journal of the International Association for the Study of Obesity. 2006;1(1):11-25.

14. Ogden CL, Carroll MD, Flegal KM. High Body Mass Index for Age Among US Children and Adolescents, 2003-2006. JAMA. 2008;299(20):2401-2405.

15. Al-Isa AN. Body mass index, overweight and obesity among Kuwaiti intermediate school adolescents aged 10-14 years. Eur J Clin Nutr. 2004;58:1273–7.

16. Malik M, Bakir A. Prevalence of overweight and obesity among children in the United Arab Emirates. Obes Rev. 2007;8:15–20.

17. El Mouzan MI, Al Herbish AS, Al Salloum AA, Al Omar AA, Qurachi MM. Regional variation in prevalence of overweight and obesity in Saudi children and adolescents. Saudi journal of gastroenterology : official journal of the Saudi Gastroenterology Association. 2012;18(2):129-32.

18. Obesity and overweight. WHO Fact sheet, Updated June 2016. http://www.who.int/mediacentre/factsheets/fs311/en/

19. Overweight and Obesity, Children, Defining Childhood Obesity: BMI for Children and Teens. last updated: June 19, 2015.
https://www.cdc.gov/obesity/childhood/defining.html
20. Kappy MS, Allen DB, Geffner ME. Chapter 7: Obesity. Definitions of overweight and obesity in children in: Principles and Practice of Pediatric Endocrinology. Charles C Thomas Publisher, 2005: 577- 606.
21. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of Childhood and Adult Obesity in the United States, 2011-2012 JAMA. 2014;311(8):806-814.
22. Salehiniya, Yazdani K, Barekati H, Lari MA. The Prevalence of Overweight and Obesity in Children Under 5 Years in Tehran, Iran, in 2012: A Population-Based Study. Res Cardiovasc Med. 2016 February; 5(1): e30425.
23. Rachmi CN, Agho KE, Li M, Baur LA. Stunting, Underweight and Overweight in Children Aged 2.0–4.9 Years in Indonesia: Prevalence Trends and Associated Risk Factors. 2016.
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154756
24. COŞOVEANU S, BULUCEA D. Obesity and Overweight in Children - Epidemiology and Etiopathogeny. Current health sciences journal 2011; 37(2).
25. Imai CM, Gunnarsdottir I, Thorisdottir B, Halldorsson TI, Thorsdottir I. Associations between infant feeding practice prior to six months and body mass index at six years of age. Nutrients. 2014;6(4):1608-17.
26. Weber M , Grote V, Closa- Monasterolo R, Escribano J, Langhendries JP, Dain E, et al. European Childhood Obesity Trial Study Group. Lower protein content in infant formula reduces BMI and obesity risk at school age: follow-up of a randomized trial. Am J Clin Nutr. 2014;99(5):1041-51.
27. Zhang J, Himes JH, Guo Y, Jiang J, Yang L, Lu Q, Ruan H, Shi S. Birth weight, growth and feeding pattern in early infancy predict overweight/obesity status at two years of age: a birth cohort study of Chinese infants. PLoS One. 2013; 8(6):e64542
28. Gebremedhin S. Prevalence and differentials of overweight and obesity in preschool children in Sub-Saharan Africa. BMJ Open. 2015 5(12):e009005.
29. Hajian-Tilaki K , Heidari B. Childhood Obesity, Overweight, Socio-Demographic and Life Style Determinants among Preschool Children in Babol, Northern Iran. Iran J Public Health. 2013;42(11):1283-91.
30. CBAHI at a glance. http://cbahi.bisecurehost.biz/english/about-us/cbahi-at-a-glance
31. Wang Y, Chen H-J. Chapter 2**:** Use of Percentiles and *Z* -Scores in Anthropometry **in:** Handbook of Anthropometry. Physical Measures of Human Form in Health and Disease 2012: 29 - 48
32. Marie NG, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980—2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014;384:766–81.
33. Rowland K1, Wallace R. Clinical inquiries: Which factors increase the risk of an infant becoming an overweight child?. J Fam Pract. 2009 Jul;58(7):383-4.