

## The Relation between Obesity and Congenital Heart Disease in School Age Children

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### Abstract:

**Background:** Congenital heart disease (CHD) is the most common birth defect; occurring in approximately 8 out of every 1,000 births The American Heart Association (AHA) estimates that 1 in 150 adults are living with CHD Obesity may pose additional cardiovascular risk to children with acquired and congenital heart disease.

**Aims:** to explore the relation between the obesity and congenital heart diseases in school age children.

**Design:** - Comparative descriptive research design was used to fit the nature of this study. **Setting:** Outpatient University Hospital of Assuit and Sohage of school age children

**Subjects:** This study included 200 of age during the School age children period from March to December 2014. They were selected randomly and divided into two equal groups; Group I (Assuit) and Group II (Sohag group) included 100 school age children for every group.

**Results:** The results showed that both sex were approximately 65 male and 35 female presented among Assuit and 42 male and 58 female from Sohag groups. Also It observed that Statistical significant differences were found in both groups as regard age, birth order, gender, residence  $P= 0.001, p= 0.002, \chi^2 = P= 0.008$ , it was noted that urban residence in Assuit more than in Sohag group. Statistical significant difference was found between the two groups as regard body mass index and the majority of children were represented obesity in both Assuit and Sohag group (45.0%, 58.0%) respectively. As these children already present the risks associated to heart disease, it was noted that urban residence in Assuit more than in Sohag group. Finally there was strongly relation between obesity and congenital heart defect in both studied group

**Conclusions:** it was concluded that the relation between growth measurements weight and height. highly statistical in the studied group in Assuit and Sohag university hospitals and between the two groups as regard body mass index and the majority of children were represented obesity in both Assuit and Sohag group (45.0%, 58.0%) respectively. Obesity was strongly associated with congenital heart defects in the both studied group...:

**Recommendation** Nutritional and obesity educational programs must be monitored and evaluated regularly to determine progress towards nutritional goals. It is particularly important to promote a healthy lifestyle in this group. Finally educational programs should be provided to increase knowledge and skills of health care professionals in applying obesity and congenital heart diseases as a management of obesity to decrease the complication,.

**Key Ward:** Congenital Heart Disease, Obesity, School age children.

### I. Introduction

During the last three decades, there has been a considerable increase in the prevalence of obesity in children and adolescents (4–18 year-old) worldwide (Kelishadi, et al., 2012). These factors, as well as physical inactivity, may track into adulthood and increase the risk of chronic diseases such as atherosclerosis (WHO, 2014). Obesity may pose additional cardiovascular risk to children with acquired and congenital heart disease. Many children with heart disease are sedentary as a result of physician-, parent-, and/or self-imposed restrictions, congenital heart disease is classified according to patterns of blood flow and will vary from simple to complex It may occur in conjunction with or as a complication of specific genetic conditions (Go et al., 2014). Identification of both CHD and genetic conditions in the newborn period will help to educate and prepare families for the challenges their child may face (Pierpont et al., 2007). Most of these children are diagnosed in early childhood and infancy (AHA, 2013). National Health and Nutrition Examination Survey 31% of children aged 6 to 19 years were overweight, defined as body mass index (BMI) at the 85th to 95th percentile, or obese (BMI  $\geq$ 95th percentile) that included in growth charts which used to identify children and adolescent who are either underweight ( $<5^{\text{th}}$ ), normal body weight between ( $5^{\text{th}} < 85^{\text{th}}$ ), overweight ( $85^{\text{th}}$  and  $95^{\text{th}}$ ) and obese ( $\geq 95^{\text{th}}$  percentile), BMI calculated by dividing weight in Kg by square height in meter (Kg/ m<sup>2</sup>) (Hockenberry and wilson, 2007) .

- Recent research indicates that a significant portion of children with congenital heart disease (CHD) are also obese or overweight. The development of obesity in children derives from a number of etiological factors,

including biological and physiological (genetic predisposition and appetite), personal (physical activity and diet), environmental, societal, and healthcare-related factors. Although obesity has not been studied systematically in individuals with CHD, compelling contributing factors include nutrition and physical activity. (Steffens *et al* 2005) Obesity is associated with the presence or future development of hypertension, insulin resistance, dyslipidemia, increased inflammatory cytokines, sleep apnea, autonomic imbalance, and abnormal cardiac remodeling. In the obese individual without CHD, hypertension is often the result of increased fluid retention associated with an increased plasma volume and cardiac output. Guidelines for children's daily energy requirements, nutrient intake, and physical activity levels have been published. Much of this work is directly applicable to children with CHD. *Am J Epidemiology* (2012) The American Heart Association's Scientific Statement on cardiovascular risk reduction outlines treatment recommendations for individuals with CHD to include evaluation of diet, blood pressure, lipids, glucose, smoking, and activity. Strategies to reduce risk in children without CHD may be equally effective in children with CHD such as parent training in behavioral modification for prevention and management of obesity. Skills to identify target behaviors, self-monitor, set goals, and provide feedback have demonstrated moderate effect in the general population. (*Am Heart J* 2001) Lasting interventions rely on the parent to model and facilitate healthy behaviors for the family, particularly for younger children, who rely more on parental support. (Prentice *A.* 2006). The school-age child is the ideal age to begin teaching the child about their healthcare needs and how to care for themselves in preparation for the future. The school-age child with CHD has specific physical, intellectual, emotional, and developmental needs that must be considered and managed using a multidisciplinary approach. Pediatric nurses must be aware of these needs as they help the child and their family seamlessly and successfully transition into young adulthood as a happy and healthy CHD. Measurement of the body-mass index represents the first step in assessment and treatment (Gurvitz *et al.*, 2013). Nurses play a key role in focusing on needs of the school-age child (ages 6-12 years) (Rodgers, 2010) with CHD promotion of health in school-age children involves chronic disease management, health maintenance education, and anticipatory guidance to prevent future health problems. Including the child early in healthcare and education about their chronic condition will improve self-care and accountability for their health in the future (Mickley, 2013, Burkhardt, & Sigler, 2013).

#### **Aim Of The Study**

was to identify the relation between obesity and congenital heart disease in school age children at Assuit and Sohag outpatient University Hospital

## **II. Subjects And Methods**

#### **Research design:-**

Comparative Descriptive research design was used to fit the nature of this study.

#### **Study Setting:-**

The present study was conducted at outpatient University hospital at Assuit and Sohag

#### **Subjects:-**

This study included 200 School age children, period from March to December 2014. They were selected randomly and divided into two equal groups; Group I (Assuit) and Group II (Sohag group) included 100 school age children for each group. They were selected randomly according to the following criteria:

#### **Inclusion criteria:-**

- Currently the school age was 5-12 years.
- Gender both sex diagnosed with congenital heart diseases and obesity
- Normal growth and physical development (by using anthropometrics measurement).
- Residence (urban and rural).

#### **Tool of data collection:**

Tool for collecting data were used in this study and included:-

1:- A Structured interview sheet was developed to collect the information from the school age children. It consists of three parts:

Part one: - general characters of the school age children including, age, gender, and birth order, residence.

Part two: - general characters of the mothers of children include the age, education, medical history of the mother, family history, and degree of cognation and classification of congenital heart diseases (Ventricular septal defect, Patent ducts arterioles, Atrial septal defect, miscellaneous

Part three: - An anthropometric measurement (Wissman, 2007):- It was used to assess the school age children growth parameters as weight, length. Anthropometric measurements of the school age children included:

- Weight which was measured by an appropriately sized balance scale by the researcher. Before the school age children was weighted, the scale was adjusted by setting it at zero and noting if the balance registered exactly in

the middle of the mark, if the end of the balance beam raised to the top or bottom of the mark one or less weight respectively (Freedman D, Wang J, Thornton JC, et al 2009)

-Height: measuring points (Nettina, 2010).

- Assessment of the school age children Body mass index

### **Methods of data collection**

The data was collected according to the following steps:

Permission: An official permission was obtained from the dean of the Faculty of Nursing, Assuit and Sohag University to the directors outpatient university Hospitals

An oral permission was obtained from the mothers and her school age children after complete explanation of study goal. The work was carried out by the researcher there

Validity of tool one was estimated by 5 experts in pediatric field and its results was 95%.

A pilot study: It was carried out on (10%) of the total number of school age children to test the clarity, applicability of the tools of data collection and to estimate the length of time needed to fill each tool. According to the results of the pilot study, the essential modifications in the study tools were done and the final form was developed, infants included in the pilot study were excluded from the study sample.

Reliability was estimated by Alpha Cronbach's test for tool two and its result was  $R= 0.85$ .

Field of the work: the data were collected two days each week for the school age children and was conducted in the morning. The time used for filling each sheet ranged between 20-30 minutes, throughout the interview relating information and recorded in the designed sheet depending upon the response of the participant. After that anthropometric measurements for the school age children were done.

### **Ethical consideration:**

The purpose of this study was explained for every interviewed individual that included directors of the school age children and the mother. The mother has the ethical rights to agree or refuse to participate in the study; consent to participate in the study was secured orally and informed that the information which was obtained was confidential and for the purpose of the study.

### **Statistical design:-**

The data were obtained reviewed, prepared for computer entry, coded, analyzed and tabulated. Data entry and analysis were done using SPSS 17.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means for quantitative variables. Using chi square to determine significance for non paretic's variables. Statistical significance difference was considered when  $P$ -value  $< 0.05$ .

## **III. Results**

Regarding children' socio-demographic data in Assuit and Sohag university hospitals, it observed that Statistical significant differences were found in both groups as regard age, birth order, gender, residence were found in both groups  $P= 0.001$ ,  $p= 0.002$ ,  $, = P= 0.008$ , it was noted that urban residence in Assuit more than in Sohag group, and showed that male children constituted 44.0% of children at Assuit and (56%) of children at Sohag. The most common age group was 45% and 38% between 6-8 years in Assuit and Sohag respectively .Most of children were 4-6birth order, finally 67.0% of children from urban area. Table (2) Showed percentage distribution of children according to their socio-demographic data in Assuit and Sohag university hospitals. Statistical significant differences were found in both groups as regard age. Mothers' education, medical history of the mother, family history about CHD, degree of relatives .It was observed that statistical significant in history of heart diseases in Assuit and Sohag, also the relatives in Sohag more than Assuit.

Regarding risk factors that increase the incidence of congenital heart disease, it was observed that hereditary factor was most frequent factor at Assuit and Sohag (59%, 49%) respectively, followed by smoking (11%, 29%), drugs (10%, 2%), diabetes (15%, 18%), and rubella was (5%, 2%) at Assuit and Sohag respectively.

Regarding Classification of congenital heart disease, it was observed in both studied groups ventricular septal defects were the most common type of congenital heart disease in assuit and sohag (39%, 43%) respectively, followed by patent ductusarteriosus (25%, 20%) in Assuit and Sohag respectively, and atrial septal defect (11%, 15%) in Assuit and Sohag respectively and miscelenous was about (25%, 22%) in Assuit and Sohag respectively.

Regarding relation between weight and height in both studied groups, the current study indicated that, there was a highly statistical significant difference was found between the two groups as regard weight and height ( $P < 0.0001$ ).

Regarding relation between body mass index and obesity, the current study mentioned that, statistical significant difference was found between the two groups as regard body mass index in both studied groups and the majority of children were represented obesity in both Assuit and Sohag group (45.0%, 58.0%) respectively.

**Table 1 : Distribution of the early and mild childhood obesity and cardiovascular diseases at Assuit and Sohag according to socio-demographic characteristic, (age, birth order, gender and residence)**

	Assuit group	%	Sohag group	%	P - value	Sig
<b>Age(years)</b>						
6-8	70	70.0%	63	63.0%	0.000	***
9-12	30	30.0%	37	37.0%		
<b>Mean± SD</b>	6.55± 4.97					
<b>Birth order</b>						
1-3	5	5.0%	14	14.0%	0.001	**
4-6	80	80.0%	74	74.0%		
More than 6	15	15.0%	12	12.0%		
<b>Gender</b>						
Male	65	65.0%	42	44.0%	0.002	*
Female	35	35.0%	58	56.0%		
<b>Residence:</b>						
Urban	80	80.0%	58	58.0%	0.008	**
Rural	20	20.0%	42	42.0%		

**Table (2) Percentage Distribution of children 'mothers according to their socio-demographic data in Assuit and Sohag university hospitals**

Items	Assuit group	%	Sohag group	%	P - value	Sig
<b>Age(years):</b>						
>20	10	10.0	4	4.0	0.009	**
20-24	11	11.0	4	4.0		
25-29	11	11.0	27	27.0		
30-35	46	46.0	37	37.0		
<35	2	2.0	8	8.0		
<b>Mean SD+-</b>						
<b>33.54 ± 5.23</b>						
<b>Mothers' education:</b>						
Illiterate	62	62.0	58	58.0	0.03	*
Read & write	8	8.0	5	5.0		
Primary education	5	5.0	11	11.0		
Preparatory education	5	5.0	10	10.0		
Secondary education	10	10.0	7	7.0		
University education	10	10.0	3	3.0		
Others	0	0.0	0	0.0		
<b>Medical history of the mother</b>						
Obesity	21	21.0	14	14.0	0.000	***
Diabetes	12	12.0	10	10.0		
Hypertension	15	15.0	20	20.0		
Heart disease	20	20.0	24	24.0		
Passive smoking	33	33.0	32	32.0		
<b>Family history about CHD</b>						
Yes	23	23.0	21	21.0	0.425	N.S
No	77	77.0	79	79.0		
<b>Degree of القرابة</b>						
Yes	37	37.0	57	57.0	0.013	*
No	63	63.0	43	43.0		

Figure (1):- Risk factors that increase the incidence of congenital heart disease

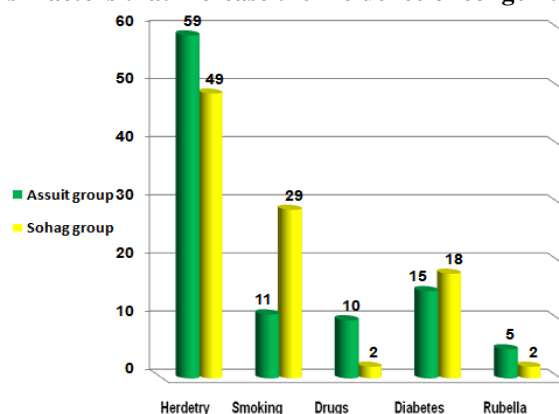


Figure (2) Classification of congenital heart disease in both studied groups

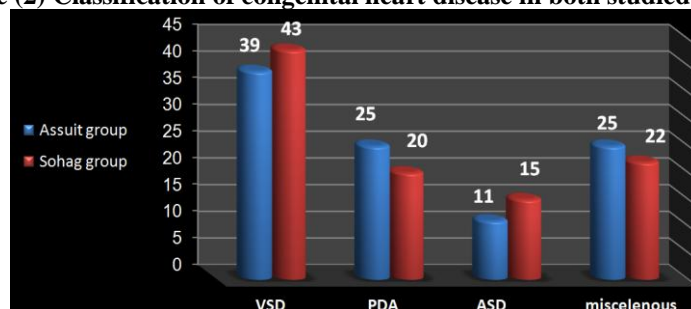


Table (3):- Therelation between growthmeasurements in the studied group in Assuit andSohag universityhospitals

Items	Assuit group	Sohag group	p- value	Sig
Weight	12.04± 34.23	10.05±26.85	0.000	***
Height	20.30±135.34	27.50±118.56	0.000	***

Table (4):- Body mass indexin the studied group in Assuit and Sohag university hospitals

BMI	Assuit group		Sohag group		p- value
	No	%	No	%	
Underweight (< 5 <sup>th</sup> percentile)	3	3.0	2	2.0	0.000 ***
Normal weight (5 <sup>th</sup> - < 85 <sup>th</sup> percentile)	28	28.0	34	34.0	
overweight (≥ 85 <sup>th</sup> and < 95 <sup>th</sup> percentile)	24	24.0	6	6.0	
Obesity (≥ 95 <sup>th</sup> percentile)	45	45.0	58	58.0	

Table (5):- The relation between congenital heart disease and BMI

Classification of congenital heart disease	Underweight (< 5 <sup>th</sup> percentile)	Normal weight (5 <sup>th</sup> - < 85 <sup>th</sup> percentile)	overweight (≥ 85 <sup>th</sup> and < 95 <sup>th</sup> percentile)	Obesity (≥ 95 <sup>th</sup> percentile)	p- value
	No (%) n=3	No (%) n=28	No (%) n=24	No (%) n=45	
<b>Assuit group</b>					
Ventricular septal defect	1(33.3%)	19 (67.85%)	17(70.83%)	20(34.48%)	0.000 ***
Patent ducts arterioles	1(33.3%)	2(7.14%)	1(4.16%)	21(36.20%)	
Arial septal defect	--	2(7.14%)	2(8.33%)	7(12.06%)	
miscellaneous	1(33.3%)	5(17.85%)	4(16.67%)	15(25.86%)	
<b>Sohag group</b> n=2 n=34 n=6 n=58					
Ventricular septal defect	1(50%)	21(61.76%)	1(16.67%)	20(34.48%)	0.000 ***
Patent ducts arterioles	--	1(2.94%)	3(50.0%)	16(27.58%)	
Arial septal defect	--	1(2.94%)	2(33.33%)	12(20.68%)	
miscellaneous	1(50%)	11(32.35%)	--	10(17.24%)	

#### IV. Discussion

Congenital heart diseases are among the most frequent major congenital anomalies and responsible for excess morbidity, premature death, health-care costs and mortality. It has been difficult to find causes of congenital heart defects. Congenital heart defects have been increased risk for. Obesity and overweight so that,

the aim of the current study was to explore the relation between the obesity and congenital heart diseases in school age children At Assuit and Sohag outpatient University Hospital.

The current study revealed that, statistical significant differences were found in both groups as regard age, birth order, gender, residence were found in both groups  $P = 0.001$ ,  $p = 0.002$ ,  $= P = 0.008$ , it was noted that urban residence in Assuit more than in Sohag group. And showed that male children constituted (44.0%) of children at Assuit and (56%) of children at Sohag. The most common age group was 45% and 38% between 6-8 years at Assuit and Sohag respectively. Most of children were 4-6 birth order, and finally 67.0% of children from urban area.

In the current study it observed that statistical significant differences were found in both groups as regard age, birth order, gender, residence were found in both groups  $P = 0.001$ ,  $p = 0.002$ ,  $= P = 0.008$ , it was noted that urban residence in Assuit more than in Sohag group. Male children constituted 44.0% of participants At Sohag and Assuit 65, of participant, these results were nearly to the results reported by **(James, et al.2010)** who reported in his study that male were about (55.7%).as regard age group was 45% and 38% between 6-8 years at Assuit and Sohag respectively, these results were in disagreement with the results mentioned by **(James, et al., 2010)** that children aged between 6 and 11 years (43.7%).Most of children were 4-6 birth order .finally 67.0% of children from urban area.

The current study revealed that, statistical significant differences were found in both groups as regard age. Mothers' education, medical history of the mother, family history about CHD Degree of relatives, it was observed that statistical significant in history of heart diseases in Assuit and Sohag, also the relatives in Sohag more than Assuit. The current study revealed that Statistical significant differences were found in both groups as regard age. Mothers' education, medical history of the mother, family history about CHD, degree of relatives, it was observed that statistical significant in history of heart diseases in Assuit and Sohag, also the relatives in Sohag more than Assuit.

The current study revealed that highly statistical significant differences were found in both groups as regard obesity, diabetes, hypertension, heart disease, passive smoking, these results was similar to the results was reported by **Messiah,et al., 2012** that observed a high frequency of excess weight in parents of children with congenital heart disease, and the study conducted by who stated that the presence of obesity in mothers in his study was directly related to their children's excess weight(**Murrin, 2012, Sonnevile, et al., 2012, Camargo et al., 2013**).And this study was also supported by who mentioned that the presence of chronic diseases in families of is correlated with children with congenital heart disease (**Cohen MS, 2012, and Pasquali, et al, 2009**).These results were also in agreement with the study conducted by **Hipple et al., 2013**who stated that passive smoking was detected in almost half of the population studied.

The present study revealed that hereditary factor was most frequent factor at Assuit and Sohag (59%, 49%) respectively, followed by smoking (11%, 29%), drugs (10%, 2%), diabetes (15%, 18%), and rubella was (5%, 2%) at Assuit and Sohag respectively

The current study revealed that ventricular septal defects were the most common type of congenital heart disease in Assuit and Sohag (39%, 43%) respectively, followed by patent ductus arteriosus (25%, 20%) in Assuit and Sohag respectively, and atrial septal defect (11%, 15%) in Assuit and Sohag respectively and miscelenous was about (25%, 22%) in Assuit and Sohag respectively, this study was similar to the study conducted by **(Mehdi, et al., 2014)** that the most frequent congenital heart disease was ventricular septal defect (39%), patent ductus arteriosus (11%), complete atrioventricular septal defect (10%), pulmonary stenosis (9.1%), and atrial septal defect (8.5%). The current study stated that A cyanotic congenital heart disease was most common in children in Assuit and Sohag (75%, 78%) respectively. These results were supported by **(Moghimi, et al, 2013)** who mentioned that a cyanotic heart disease is more frequent (70%) than others heart disease in children.

In the current study indicated that,there was a highly statistical significant difference was found between the two groups as regard weight and height ( $P < 0.0001$ )

The current results indicated that, statistical significant difference was found between the two groups as regard body mass index and the majority of children were represented obesity in both Assuit and Sohag group (45.0%, 58.0%) respectively, these results was in accordance with the results mentioned by **(James, et al.2010)**, that, There was a highly significant trend of increasing for congenital heart defects with increasing obesity ( $P < 0.0001$ ), also supported by results of **Sandra, 2014**, which indicated that there was a high prevalence of excess weight in children and adolescents with congenital heart disease.And the current study was also in agreement with **Stefan, et al., 2005** who found that 26% of 1523 patients, seen in 2 large outpatient pediatric cardiology clinics, were overweight or obese. This study was disagree with the results of a study conducted by **Moghimi, et al, 2013** who stated that overweight and obesity were not significantly associated with congenital heart defects.

In the current study indicated that, there was a highly statistical significant difference was found between the two groups between congenital heart disease and BMI, these results was in accordance with the results mentioned by (James, et al.2010), that, There was a highly significant trend of increasing for congenital heart defects with increasing obesity ( $P < 0.0001$ ), also supported by results of Sandra, 2014, which indicated that there was a high prevalence of excess weight in children and adolescents with congenital heart disease. And the current study was also in agreement with Stefan, et al., 2005 who found that 26% of 1523 patients, seen in 2 large outpatient pediatric cardiology clinics, were overweight or obese. This study was disagree with the results of a study conducted by Moghimi, et al, 2013 who stated that overweight and obesity were not significantly associated with congenital heart defects.

## V. Conclusion

It was concluded that The relation between growth measurements weight and height highly statistical in the studied group in Assuit and Sohag university hospitals, Statistical significant difference was found between the two groups as regard body mass index and the majority of children were represented obesity in both Assuit and Sohag group (45.0%, 58.0%) respectively. Obesity was strongly associated with congenital heart defects in the both studied group.

## Recommendations

Based on the results' of this study, we recommended that: educational programs should be provided to increase knowledge and skills of health care professionals in applying obesity and congenital heart diseases as a management of obesity to decrease the complication, teach these to parents, and encourage use with each safe diet, activity experience, educational programs for care givers and teachers for school age children good nutrition and prevent of obesity and heart diseases at school age. Nutritional and obesity educational programs must be monitored and evaluated regularly to determine progress towards nutritional goals. As these children already present the risks associated to heart disease, it is particularly important to promote a healthy lifestyle in this group.

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