

Factors contributing to increase blood pressure level among primary school children

Azza Mostafa Darwish
Professor of Pediatric Nursing,
Faculty of Nursing, Alexandria University

Rahma Soliman. Bahgat
Professor of Pediatric Nursing,
Faculty of Nursing, Tanta University

Ehsan Noman
B.Sc.N Faculty of Nursing, Tanta University

Abstract

Blood pressure is the force of the blood pushing against the walls of the arteries. Hypertension is the most common disease specific for seeking medical care. This study aims to identify factors contributing to increased blood pressure level among primary school children in ElMahala ElKobra .The study was conducted at the primary governmental schools for children in ElMahala ElKobra (15 schools from East zone and 10 schools from West zone) .The total numbers of the students in tow zones are expected to be approximately 1000 (Boys and Girls). Three tools were developed by the researcher in order to obtain the necessary data for the study Questionnaire sheet. Physical assessment, Anthropometric measurement sheet. Blood pressure measurement. Urine analysis for the primary school children. The results showed that mean level blood pressure measurements of the students, it was found that 4% of the primary school children had a mean level of hypertension 130.75 ± 22.36 mm Hg. Significant differences were found between the age of primary school children and their mean level blood pressure measurements. Significant differences were founded between mean level of blood pressure measurement and standard body mass index (BMI) of primary school children. From the present study it can be concluded that there are many factors increasing blood pressure level of the primary school children, which include controllable factors as obesity, sedentary lifestyle, stress, nutritional habits, and uncontrollable factors as age, gender, medical and family history. It is recommended to improve students' knowledge about factors contributing to hypertension and its complication. Health education and counseling of primary school children and their mother should include feeding habits, hygiene, exercises, recreational activities and measurements of blood pressure.

Introduction

Blood is carried from the heart to all parts of the body in vessels called arteries. ⁽¹⁾ Blood pressure is the force of the blood pushing against the walls of the arteries. Blood pressure varies widely through Normal blood pressure in children varies according to age, gender, weight and height of a children. ⁽²⁾ Normal blood pressure values gradually increase from infancy through adolescence. ⁽³⁾ The important, ongoing study and others confirm that regular measurement of blood pressure in childhood is an essential part of good primary pediatric care. ⁽⁴⁾

Blood pressure should be measured in a controlled environment after five minutes of rest in the seated position with the right arm supported at heart level A; the cuff bladder width should be approximately 40% of the circumference of the arm measured at a point midway between the olecranon and the acromion. B, Cuff bladder length should cover 80% to 100% of circumference of the arm. C, the blood pressure should be measured with cubital fossa at heart level. The Arm should be supported. Stethoscope bell is placed over brachial artery pulse, proximal and medial to cubital fossa and below the bottom edge of cuff. ⁽⁵⁾

Hypertension is the most common disease specific for seeking medical care. It is currently among the leading

causes of mortality and morbidity. Hypertension in childhood is defined as blood pressure reading greater than or equal to the ninety-fifth percentile for age, sex, height taken on three separate occasions. Hypertension in children is viewed now as a significant risk factor for the development and progression to adult cardiovascular disease. There are two types of hypertension, Essential hypertension and secondary hypertension ⁽⁶⁾.

Essential hypertension is also known as idiopathic or systemic hypertension of unknown cause. It is caused by a complex interaction of controllable (e.g., obesity, smoking, sedentary lifestyle) and uncontrollable (e.g. genetic predisposition) Risk factors. Secondary hypertension has a clearly identifiable Cause; the elevation of blood pressure associated with secondary hypertension is the result of having another illness or condition or using certain medication or products ⁽⁷⁾.

Children with secondary hypertension can have clinical manifestation of the underlying disease such as growth failure in children with chronic renal disease. With substantial hypertension, however, headache, dizziness, epistaxis, anorexia, visual changes and seizures may occur. Hypertensive encephalopathy ^(8,9), late signs of severe and/or acute hypertension include

neurologic deficits, extremity weakness, cerebrovascular accidents, renal signs, weight loss or failure to gain weight, facial or pretibial abdominal mass. Cardiovascular signs include: absent or decreased femoral pulses, decreased blood pressure in the lower extremities compared with the upper extremities, cardiomegaly, murmur, and signs and symptoms of chronic heart failure⁽¹⁰⁾.

There are many factors contributing to increased blood pressure among primary school children: Uncontrollable factors as: Age, gender, race, family history. Controllable factors as: obesity, sedentary increased sodium and decreased potassium in diet, drinking alcohol, life style, tobacco use, stress^(11,12).

Management of primary hypertension includes weight reduction, physical conditioning, dietary modification and stress modification⁽¹³⁾. management of secondary hypertension focus of therapy in patients with renal or endocrine conditions focus on the disease process, effective treatment will often in secondary control of blood pressure⁽¹⁴⁾

The nurse plays an important role in assessing individual families and providing targeted information regarding nonpharmacologic modes of intervention, such as diet, weight loss, smoking cessation, and exercise programs. Continued education, support, and reinforcement for positive

behavior are a major nursing responsibility.⁽¹⁵⁾

Aim of this study: The study aimed to identify factors contributing to increased blood pressure level among primary school children In ELMahala ELkobra

Materials and method

Settings: The study was conducted in representative primary governmental schools for children at Elmahala Elkobra (15 schools from East zone and 10 schools from West zone)

Sample: Study sample was selected from previous setting using the stratified random sample. The totals of 25 schools are including in the study (15 schools from East zone and 10 schools from West zone). From each school one class was chosen randomly (5 classes first grade, 5 classes 2nd grade, 5 classes 3rd grade 5classes 4th grade, 5 classes 5th grade). The total number of study sample was 1000 students and both sex.

Exclusion criteria: Secondary hypertension, chronic disease.

Tools of the study: Three tools were developed by the researcher in order to obtain

the necessary data for the study

- 1- Questionnaire sheet: to collect the Sociodemographic of data.
- a- Personal data about the school age child: age sex, birth order, academic level of school year
- b- Feeding habits regarding the consumption and frequency of salty

food/week and physical activity

- 2- Physical assessment sheet to assess health status of the child. It included observation for general condition from head to toes
- 3- a) Anthropometric measurement sheet, they included weight, height, mid arm circumference and skin fold thickness to determine under weight, overweight, and obesity. Each of measurement was taken according standard procedures recommended by Jelliffe 1966⁽¹⁶⁾
- b) Blood pressure measurement was performed by using standardized mercury sphygmomanometer with manually inflated cuff and stethoscope.
- c) Urine analysis was analyzed for all students to exclude secondary hypertension due to renal disease.

Method:

An official permission to conduct the study was obtained from the responsible authorities (Ministry of education). List of the primary school and the number of students was obtained from the two educational zones in Elmahala el kobera .Data was collected within 6 starting from October 2005. Three tools were used in the study: structure questioner sheet and observation check list. These tools were developed by the researcher after reviewing of literature and validity of the contents was revised by 5 experts in

pediatric field. School age children were seen in the school for physical assessment of the student from head to toes for assessing general condition and 10-15 minutes for anthropometric measurement include height, weight, body mass index, mid arm circumference and skin fold thickness. The corresponding Egyptian standard of physical growth for age and sex.

Blood pressure in children was measured for each student in supine position after five minutes of rest at least three separate occasions on three consecutive days .The mean average was recorded for each student. Urine analysis was analyzed for all students to exclude secondary hypertension due to renal disease

Data analysis:

Data was organized, tabulated and statistically, analyzed using SPSS software statistical computer package version 12 for quantitative data, the range, and mean standard deviation was calculated. Pearson correlation, correlation coefficient and spearman's rank correlation were to test the association between two variables. Chi square was used as a test of significance and when found inappropriate.

Fisher exact test was used, significance was adopted at P less than 0.5

Results

The study revealed the distribution of primary school children according to socioeconomic characteristics.

Children age ranged from 6 to 12 years with the mean ages 9.04 ± 1.88 , less than half of the children (40.90%) are between ages 10 – 11 years. Female constitutes 56.10% of children, while 43.90% are males. Less than quarter of the children 24.40% are third grade of primary school. Less than half of children 37.30% are first in birth order compared to 4.20% who is fifth and more in birth order.

Table (1) shows percent distribution of primary school children according to feeding habits. Regarding regularity of meals it was noticed that more than half of the students 59.40% were always eating at regular time. As regards types of food dislike, it was noticed that more than half of students 64.90% was dislike the bread. As regards eating while watching TV, it was noticed that 48.13% of the sample watched TV while eating, while 51.87 of the sample not eating while watching TV. Regarding eating ships and chocolates, it was noticed that more than half of students 71.80% had eating ship and chocolate.

Table (2) show percent distribution of students according to their physical assessment regarding face condition it was noticed that more than half of the students 63.10% had happiness face, while 4.60% had a cooling face. Regarding lid of eyes it was notice that less than three quarter of the students 72% had a normal lid of eyes while lips condition was noticed that less

than three quarters of the students 73% had a rosy colors in compared to pale condition it was noticed that less than one quarter 23.80%.As regards skin color it was noticed that less than half of the student 31.88% had pale skin. Regarding respiration it was noticed that more than three quarters of the students 76.50% had a normal respiration while 9.50% had increased number of respiratory rate. As regards gastrointestinal tract change it was noticed that 8.10% had abdominal distension while 7.30 % had constipation. Regarding heart rate it was noticed that more than three quarters 75.1% had a normal heart rate. Table (3) shows percent distribution of The primary school Children according to anthropometric measurement, as regards percent standard weight for age and sex, it was noticed that less than half of the students 49.8% were under weight (less than 90 % their standard weight for age and sex), while 14.7% of the students within the normal standard weight 90 100% compared to 35.5% of the student were overweight (over 110%). As regarding percent standard height for age and sex, it was noticed that three quarter of the students 75% were normal height for their age and sex (between 90 and 110%) while 10% of the students were (over 110% height of the standards).As regarding to their percent standard upper mid arm circumference for age and sex, The table shows that half of

the students 50% were normal mid arm circumference 90 – 100% while 10.5% of the students were >100% of the standard. As regarding to the percent standard of skin fold thickness for age and sex , it was noticed that more than half of the students children 66.3% were less than 80% of the standard of the skin fold thickness, while 17.3% of the students were over 100 % standard of skin fold thickness .

Table (4) show percent distribution of student according to their Body Mass Index

(BMI) , it was noticed that more than half of the students 55.1% had a normal weight, While 12.4 % of the sample had obesity.

Table (5) shows the percent distribution of primary school children according to their urine analysis. It was noticed that 58.40% of the primary school children had negative in their urine analysis, while 4.20% of the sample had ova in their urine.

Table (6) shows percent distribution of primary school children according to their mean Level blood pressure measurements, it was noticed that 3.10% of the primary school children with the mean level blood pressure measurements were a high normal blood pressure with the mean 120.11 ± 8.365 and 3.10 of the primary school children with mean level blood pressure were high normal blood pressure and their mean SD 80.13 ± 10.25 . It was noticed that 4% of

the primary school children with the mean level blood pressure with the mean SD 130.75 ± 22.36 and 7.90% of the primary school children with the mean level blood pressure measurements were hypertension diastolic blood pressure and their mean SD 87.848 ± 18.321 .

Table (7) presents the relation of age of primary school children and mean level blood pressure measurements. It was noticed that 2.79% at age 6 hypertensive on a systolic blood pressure and 6.51% had a diastolic hypertension, while 19.23 % the age of 12 years of primary school children had a systolic hypertension and 15.38% had a diastolic hypertension. On the other hand a positive relation was found between the age of primary school children and their mean level blood pressure measurements.

Table (8) shows the relation of practicing sports of primary school children and mean level blood pressure measurements . It was noticed that 9.68% had systolic hypertension the primary schools children which practicing sports and 9.98 % had diastolic hypertension. It was noticed that 12.39% had systolic hypertension of primary school children which no practicing sports and 13.25 % had diastolic hypertension. A significant difference founded between the practicing sports of the primary school children and mean level of blood pressure measurements.

Table (9) Presents the relation between respiration of primary school children and mean level blood pressure measurement, which 5% of students had systolic hypertension, whose complain a cough and 12.86% of students had a diastolic hypertension, whose complain a cough. It was noticed that a significant difference were observed between respiration of primary school children and mean level blood pressure measurement.

Table (10) shows the relation of heart rate of primary school children and mean level blood pressure measurements 4.53% had a systolic hypertension of students with a abnormal heart rate pressure, 9.88% had diastolic hypertension of students with tachycardia or bradycardia. It was clear that a negative correlation was found between heart rate of primary school children and mean level blood pressure measurements.

Table (11) presents the relation of mean blood pressure measurement and standard body mass index (BMI) of primary school children, it was noticed that 53% of overweight students were hypertension on systolic blood pressure measurements, 49 % of them were hypertension on diastolic blood pressure measurements. While 81% of obesity students were hypertension on systolic blood pressure measurements, 60% of them were hypertension on diastolic blood pressure measurements. This correlation shows that there is a significant difference had founded between mean level of blood pressure measurement and standard Body Mass Index (BMI) of primary school children.

Table (1): Percent Distribution of Primary School Children According to their Feeding Habits

Feeding Habits	n=1000 No.	%
Eating at a regular times		
Always	594	59.40
Sometimes	301	30.10
Never	105	10.50
Number of meals/day.		
Two	172	17.20
Three	806	80.60
Four	22	2.20
State of appetite		
Good appetite	432	43.20
Poor appetite	568	56.80
Types of food disliked*		
Vegetables	289	28.90
Fruits	145	14.50
Sweet	4	0.40
Beans plant protein	77	7.70
Meat animal protein	51	5.10
Bread	649	64.90
Sleeping directly after having dinner		
Yes	255	25.73
No	736	74.27
Eating while watching TV		
Yes	476	48.13
No	513	51.87
Eating chips and chocolate		
Yes	718	71.80
No	282	28.20
Mixed oil	269	26.90

*Some of the sample mentioned more than one answer

Table (2): Percent Distribution of Primary School Children According to their Physical Assessment.

Physical Assessment.	No. n=1000	%
Face		
Happiness	631	63.10
Sadness	323	32.30
Cooling face	46	4.60
Eyelids		
Dryness	108	10.88
Redness	170	17.12
Normal	715	72.00
Lips		
Rosy color	730	73.00
Pale	11	1.10
Inflamed	238	23.80
Cracked	21	2.10
Tongue		
Rosy color	703	70.80
White layer	208	20.95
Ulcer	82	8.26
Skin		
Normal	428	42.80
Pale	157	15.70
Swallowing blue	415	41.50
Respiration		
Normal respiration	765	76.50
Increase number of respiratory rate	95	9.50
Cough	140	14.00
Bowel movement		
Normal	846	84.60
Abdominal distension	81	8.10
Constipation	73	7.30
Heart rate		
Normal	751	75.10
Tachycardia or Bradycardia	243	24.30

Table (3): Percent Distribution of Primary School Children According to their Anthropometric measurement of the primary school children

Anthropometric measurement	N	%
Percent standard weight		
<90	498	49.8
90-100	147	14.7
>110	355	35.5
Total	1000	100
M + SD	101.008 + 25.36	
Percent Standard Height		
<90	100	10
90-100	750	75
>110	150	15
M + SD	131.366 + 38.65	
Percent standard Mid arm circumferences		
<90	395	39.5
90-100	500	50
>110	105	10.5
M + SD	95.168 +25.39	
Percent standard skin fold thickness	N	%
<80	663	66.3
80-110	164	16.4
>110	173	17.3
M + SD	77.047+17.85	

Table (4): Percent Distribution of Primary School Children According to their percent standard Body Mass Index (BMI)

BMI	n=1000 NO.	%
Under weight less than 18.5	170	17
Normal weight 18.5-24.9	551	55.1
Over weight 25.5-29.5	155	15.5
Obesity more than 30	124	12.4
Total	1000	100

Table (5): Percent Distribution of Primary School Children According to their Urine Analysis.

Urine	n=1000 No.	%
Negative	584	58.40
Crystals	170	17.00
Epith. Cells	98	9.80
Mucous	106	10.60
OVA	42	4.20

Table (6): Percent distribution of primary school age children according to percent mean level blood pressure

Level of blood pressure (mmHg)		n=1000 No.	%	M ± SD
Normal Blood pressure <90	SBPC	929	92.90	95.69 ± 10.820
	DBPC	889	88.90	37.66 ± 17.32
High normal 90-94	SBPC	31	3.10	120.11 ± 8.365
	DBPC	32	3.20	80.13 ± 10.25
Hypertension 95-99	SBPC	40	4.00	130.75 ± 22.36
	DBPC	79	7.90	87.848 ± 18.321

Table (7): Relation of Mean Blood Pressure Measurements and Age Among Primary School Children.

Age	Normal Blood pressure < 90				High normal 90 – 95				Hypertension 95 – 99			
	SBPC		DBPC		SBPC		DBPC		SBPC		DBPC	
	N	%	N	%	N	%	N	%	N	%	N	%
6-	197	91.63	191	88.84	12	5.58	10	4.65	6	2.79	14	6.51
8-	327	93.43	323	92.29	19	5.43	0	0.00	4	1.14	27	7.71
10-	383	93.64	353	86.31	0	0.00	32	7.82	26	6.36	24	5.88
12-	21	80.77	22	84.62	0	0.00	0	0.00	5	19.23	4	15.38
Chi-square	SBPC	X ²	52.324									
		P-value	<0.001*									
	DBPC	X ²	33.227									
		P-value	<0.001*									

Table (8): Relation of Mean Blood Pressure Measurements and Consumption of Salty Food.

Consumption Of Salty Food	Normal Blood pressure < 90				High normal 90 – 95				Hypertension 95 – 99			
	SBPC		DBPC		SBPC		DBPC		SBPC		DBPC	
	N	%	N	%	N	%	N	%	N	%	N	%
Yes	74	54.41	63	46.32	28	20.59	37	27.21	34	25.00	36	26.47
No	658	76.16	566	65.51	146	16.90	198	22.92	60	6.94	100	11.57
Chi-square	SBPC	X ²	49.262									
		P-value	<0.001*									
	DBPC	X ²	26.969									
		P-value	<0.001*									

Table (9): Relation of Mean Blood Pressure Measurements and Respiration of Primary School Children.

Respiration			Normal Blood pressure < 90				High normal 90 – 95				Hypertension 95 – 99			
			SBPC		DBPC		SBPC		DBPC		SBPC		DBPC	
			N	%	N	%	N	%	N	%	N	%	N	%
Normal			673	87,97	650	84,97	35	2,58	49	6,41	57	7,45	66	8,63
Dyspnea			84	88,42	76	70,53	6	6,32	7	7,37	5	5,26	12	12,63
Cough			123	87,86	119	85,00	10	7,14	3	2,14	7	5,00	18	12,86
Chi-square	SBPC	X2	3.274											
		P-value	0.513											
	DBPC	X2	7.490											
		P-value	0.112											

Table (10) Relation of Mean Blood Pressure Measurement According to Heart Rate of the Primary School Children.

Heart Rate			Normal Blood pressure < 90				High normal 90 – 95				Hypertension 95 – 99			
			SBPC		DBPC		SBPC		DBPC		SBPC		DBPC	
			N	%	N	%	N	%	N	%	N	%	N	%
Normal			669	89.70	656	86.66	33	4.36	37	4.89	45	5.94	64	8.45
Abnormal			218	89.71	205	84.36	14	5.76	14	5.76	11	4.53	24	9.88
Chi-square	SBPC	X2	1.424											
		P-value	0.491											
	DBPC	X2	0.811											
		P-value	0.667											

Table (11): Relation of Mean Level of Blood Pressure Measurements and Standard Body Mass Index (BMI) of Primary School Children.

Standard Body Mass Index			Normal Blood pressure < 90				High normal 90 – 95				Hypertension 95 – 99			
			SBPC		DBPC		SBPC		DBPC		SBPC		DBPC	
			N	%	N	%	N	%	N	%	N	%	N	%
Under weight less than 18.5			9	53%	8	47%	4	24%	5	29%	4	24%	4	24%
Normal weight 18.5-24.9			220	40%	207	38%	186	34%	195	35%	145	26%	149	27%
Over weight 25.5-29.5			35	23 %	38	25%	38	25%	41	26%	82	53%	76	49%
Obesity weight more than 30			17	14%	19	15%	26	21%	30	24%	81	65%	75	60%
Chi-square	SBPC	X ²	2.1425											
		P-value	0.050*											
	DBPC	X ²	1.523											
		P-value	0.068											

DISCUSSION

The blood pressure is a result of the cardiac output and peripheral vascular resistance. Elevated blood pressure is now recognized as an important health issue in pediatric population. Hypertension in children is viewed now as a significant risk factor for the development and progression to adult cardiovascular disease.⁽¹⁷⁾

Pediatric hypertension is increasing in prevalence with the pediatric obesity epidemic. Diagnosis of hypertension in children is complicated because normal and abnormal blood pressure values vary with age, sex, and height and are therefore difficult to remember.⁽¹⁸⁾

The nurse is a valuable link in the health care delivery system in reaction to hypertension in the pediatric age group being, active in detection, diagnosis, and therapy in different settings – hospital, school, clinic, private office, public health services and private practice. Nursing intervention focuses on education, family support and adherence to the treatment regimen. The nurse may consult a dietitian and collaboratively develop a teaching plan regarding a modified – sodium and weight – reduction diet if ordered.⁽¹⁹⁾

In the present study, the main focus was on factors contributing to increased blood pressure level among primary school children. The socioeconomic characteristics of the

sample, blood pressure changes were collected according to stage of age and many other factors such as sex, birth order, school grade. Regarding age, the present study revealed that the age of the children ranged from 6-12 years with a mean of age 9.04 years. Educated children have important roles to be cooperative with caregivers during measuring their blood pressure, assessing their health status and carrying out any health instructions⁽²⁰⁾.

As regards feeding habits of the students (Table 1) the present study revealed that 48.13% of the samples were eating while watching TV. This agrees with Dietz (2003) who stated that the majority of the obese children are eating while watching TV for several hours. TV viewing produces sedentary life style and children & tends to watch more Television⁽²¹⁾. In a similar study, Kathryn Smith (2000) who found that each hourly increment of TV viewing by children has been associated with increase in the prevalence of obesity⁽²²⁾. Every stage of age needs especial nutritional plan for growth and development. Assessing the nutritional status of the child explains health status of the child because many types of food have a strong relation with many diseases such as heart diseases, kidney diseases, hepatic diseases and orthopedic problems. Obesity is the result of unbalanced diet and is explained by

that the carbohydrates energy in the diet is deposited in the body as fats and in turn increases the risk of overweight and obesity⁽²¹⁾.

Physical assessment is the accurate observation for general condition from head to toes of the children (Table 2), to assess health status of the children and to exclude any child who has any health problem which might affect the blood pressure. Physical assessment of children with essential hypertension was normal in most of the studied sample⁽²³⁾.

In the current study, the relation between mean level of blood pressure measurement and age of the sample, it was statistically significantly correlated with age (table 7) 2.79% of the sample had systolic hypertension at age 6, while 19.23% of the sample had systolic hypertension at age 12. This result is in accordance with El-Zambely (2004), who found that, there was a positive correlation between systolic blood pressure and age of the child⁽²⁴⁾. These findings were also in agreement with the finding in another different study by Badaruddoza and Afzel(2000),who studied 899 school children aged 6-12 years in India and reported that systolic blood pressure had strong positive correlation with age⁽²⁵⁾.

On the other, hand the relationship between diastolic hypertension and age was statistically significant This results agrees with Durta et al. (2000),who

studied 474 children aged 6-13 years and found positive relation between diastolic blood pressure to many variables such as age , height and weight⁽²⁶⁾ . This might be attributed to that, the rise of blood pressure with increasing age is most probably caused by growth of the child⁽²⁷⁾. As explained by Whelton et al. (2004) blood pressure in children is related to somatic growth and is tied to increased height, skeletal maturation and sexual maturation, also body size exerts a profound influence on a variety of physiological functions, including blood pressure⁽²⁸⁾.

In the present study, there was correlation between mean Blood Pressure measurements and consumption of salty food. as in(Table 8) the students Artinian,Washington,&Temlin,2002 reported that children who are sodium sensitive retain sodium too easily, leading to fluid retention and increased blood pressure. High sodium consumption increases blood pressure in children leading to hypertension⁽²⁹⁾. Table (9), shows that there was a positive relation between consumption of salty foods and mean level blood pressure measurements, this is a agreement with the National High Blood Pressure Education Program (NHBPEP)2004⁽³⁰⁾. And Second Task Force on Blood Pressure Control in children 1987 the degree of sodium restriction necessary to decrease blood

pressure has not been established but it is recommended that the dietary intake should have no-added-salt.

In the present study, there was a negative relation between respiration of students and mean level of blood pressure measurement this was evident in (Table 9) and disagrees with Falkner B(2004)⁽³¹⁾.

The relation between mean level blood pressure measurement and bowel movements of students is observed in (Table 9). Significant differences were found between them, which in agreement with Sorof (2004) who found that, constipation leads to increased level of blood pressure measurements⁽³²⁾.

Anthropometric measurements are used as main criteria for assessing the adequacy of diet and growth among children .Four indices are commonly used for that purpose, namely: the body weight, body height, skin fold thickness, mid arm circumferences. Deficit in one or more of the anthropometric indices is often regarded as evidence of under nutrition which commonly results from interaction between poor diet and diseases⁽²⁰⁾.As the actual amounts of fat in a child cannot be measured clinically, and there is no single measurement adequate to assess body fat, so anthropometric measurements are used in combinations to express overweight and obesity⁽²³⁾. As regards standard weight in relation to

the mean level of blood pressure measurements (table 3), it was found that the mean level of standard weight increases with high normal of blood pressure and hypertension, the difference was statistically significant. This result is in agreement with Sorof (2004)⁽³²⁾, where children who are overweight and obese are more likely to have high blood pressure than those weights with under control. Weight reduction plays an important role in lowering blood pressure.

In the present study, there was a relation between mean level blood pressure measurements and standard body mass index of the sample, 81% obesity children had hypertension on systolic blood pressure measurements and 60 % of them had hypertension on diastolic blood pressure measurements, so there was statistically significantly difference (Table11). These results are in agreement with Jonathan. Ronald. Portman,(2003) their survey identified a high prevalence of overweight that was associated with elevated SBP among preschool-aged children in Iran. The effect of higher BMI on mean SBP is present in childhood and can be used as a predictor of high SBP even in children as young. The prevalence for hypertension increased progressively as the BMI percentile increased⁽³³⁾. Falkner B,(2006) stated that Obese children are at approximately a 3-fold higher risk for hypertension than non-obese children. In addition, the risk of

hypertension in children increases across the entire range of body mass index (BMI) values and is not defined by a simple threshold effect⁽³⁴⁾.

Conclusion

From the present study it can be concluded that there are many factors responsible for increased blood pressure level of the primary of school children, which include controllable factors as obesity, sedentary lifestyle, stress, nutritional habits, and Uncontrollable factors as age, gender, race, health history.

Recommendation:

Based on the previous findings from the current study the following recommendations are suggested: -

- The child's blood pressure must be checked starting at the school age. Unless they already have a high risk condition
- School-based programs must be reconstructed to improve students' knowledge about factors contributing to hypertension and its complications.
- Simple booklet should be available in primary school children with simple explanation of health maintenance style, disorders for children's blood pressure.
- Health education and counseling of primary school children and their mothers should include feeding habits, hygiene, exercises, recreational activities and measurements of blood pressure.

-The Ministry of Education and Ministry of Health should initiate national strategies for health education of children based on family life and healthy lifestyle.

-The school nurse must be properly trained for accurate observation and assessment of all school children.

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