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CARDIOVASCULAR DISEASE AND DIABETES MELLITUS (DM) ASSOCIATION WITH POSITIVE FAMILY HISTORY IN THE CHILDREN OF PAKISTAN (AGE GROUP 8 – 10 YEARS)

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Abstract:

Objective: The aim of the analysis is to evaluate the possible risk factors of diabetes and cardiac diseases among children in Pakistan. The research also includes the association of such children with corpulence and previous history in close relatives for the diseases under discussion.Design: The questionnaire method was used for the collection of demographic and other required data (family history and eating habits etc). The children were studying in four different schools and were between 8 – 10 years of age. Blood samples for insulin, lipids profile and fasting glucose were taken.Setting: A total of ninety-nine children participated in the current which was carried out at Services Hospital, Lahore and included the students of various schools (June, 2016 to September, 2017). Required blood samples were obtained for each child.Subjects: The results were compared with a control group of 39 children. Children who had a family history of diabetes were 44 in numbers and those who had a CHD were 16. Results: The children BMI was slightly higher in cases of positive family incidences of diabetes as compared to the control group. Arm fat percentage and waist measurements mean values were also a bit higher but yet not higher enough to be statistically significant. The obese children were having the same risk factors and were not statistically significant. On the other hand, the children with increased arm fat percentage showed higher readings for Triglycerides, LDL-C, Cholesterol, HDL, LDL and Insulin.Conclusion: The risk factors associated with cardio vascular disease and diabetes inherited by the children from their families is well known and can be checked by the percentage of fat in the body. Therefore, in case of absence of previous family history in some cases, arm fat is considered as an independent measure of the risks factors of the said disease among children.

Keywords: *Obesity, Triglycerides, Diabetes, Heart disease, Family history, Lipids*

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INTRODUCTION:

CVD and diabetes are highly affecting the population of Pakistan, specially in the urban population [1]. Primary cause of these diseases is considered as the genetic pre-disposition. CVD and diabetes incidence are largely associated with the history of the family [2]. It is established from so many years that early age identification of the hyper-cholesterol can be made. Cholesterol control can control the CVD and diabetes incidence with recommended screening [4]. Children may also be screened for the T2DM and CVD such as hyper-insulinemic [5, 6]. Children of Pakistan with positive family history are to be screened for the heart disease and diabetes in order to avoid associated risk factors and related disorders.

SUBJECTS AND METHODS:

This was a case-control comparative study. A total of ninety-nine children participated in the current which was carried out at Services Hospital, Lahore and included the students of various schools (June, 2016 to September, 2017). Required blood samples were obtained for each child. A total of 132 children were initially selected from four different primary schools for the purpose of the study. The parents were informed and their approval was granted for the children's participation in the research. The departmental Ethical Review Board approval for the conduct of the study was obtained. The sample of 132 was finally reduced to 99 children. The age range of the sample was between eight to ten years. The sample was further distributed into three categories; First group (Group A) included all the children with positive diabetes inheritance from the family with or without heart disease, second group (Group B) consisted of the children with positive cardiac inheritance from the family with or without diabetes and the third control group (Group C) in which all the children without any history of CHD or diabetes were included.

The sample selection was made in two steps. Initially, all the children between 8 – 10 years of age were examined for their health, body weight at the time of birth was obtained and current body weight was measured for each child. Family history for the diabetes and cardiac diseases was also recorded. The children were kept in three different groups according to the study criteria (family history) and they were asked to participate in second phase of the research after explaining them the procedures and objective of the study. The written request for approval of the parents of the willing children was submitted and finally a sample of 99 children was selected for the research. Initially, 333 students participated in the study, 158 were selected according to the study protocol but only 99 children were willing for giving the blood samples.

The incidences of cardiac diseases and diabetes are very high in Pakistan especially in urban areas. The major cause of these diseases is association of the family members to the diseases.

The physical characteristics were measured for each child which included waist, height, hip, weight and skin-folds, the blood samples and BP measurements were conducted at he schools by the paramedical staff of Baqai institute of diabetology and endocrinology (BIDE).

Stadiometer was used for the measurement of height [7], transportable weighing machine for measurements of weight. The weight was measured in single layer of inners and without shoes. Triceps' thickness was measured by using skinfold calipers (Holtain skinfold calipers) [7]. Similarly, measurement for mid-arm perimeter, hip circumference and waist perimeter were carried out by using a non-stretchable measuring tape.

The blood samples of the children were taken in school by BIDE team and further dispatched to laboratory for analysis and results. The samples were shifted to laboratory in suitable containers in minimum possible time (averagely 30 minutes). The fasting status was confirmed by the parents and the children were also asked if they had eaten or drunk anything before the blood test. A doctor and a teacher were available at school to supervise the activity. The children were provided eatables after the delivery of sample. Blood results were checked for the readings of triglycerides, lipid profile, fasting blood glucose, cholesterol, fasting insulin levels LDL and HDL.

The children were given a predesigned form to record their dietary habits and routine pattern of daily diet. The information so collected was used to compare and analyze the children food pattern and consumption.

Different statistical tools such as ANOVA, chi-square test, Spearman's regression analysis etc. were used to check the significance of different variables. SPSS was used for analysis of statistical data.

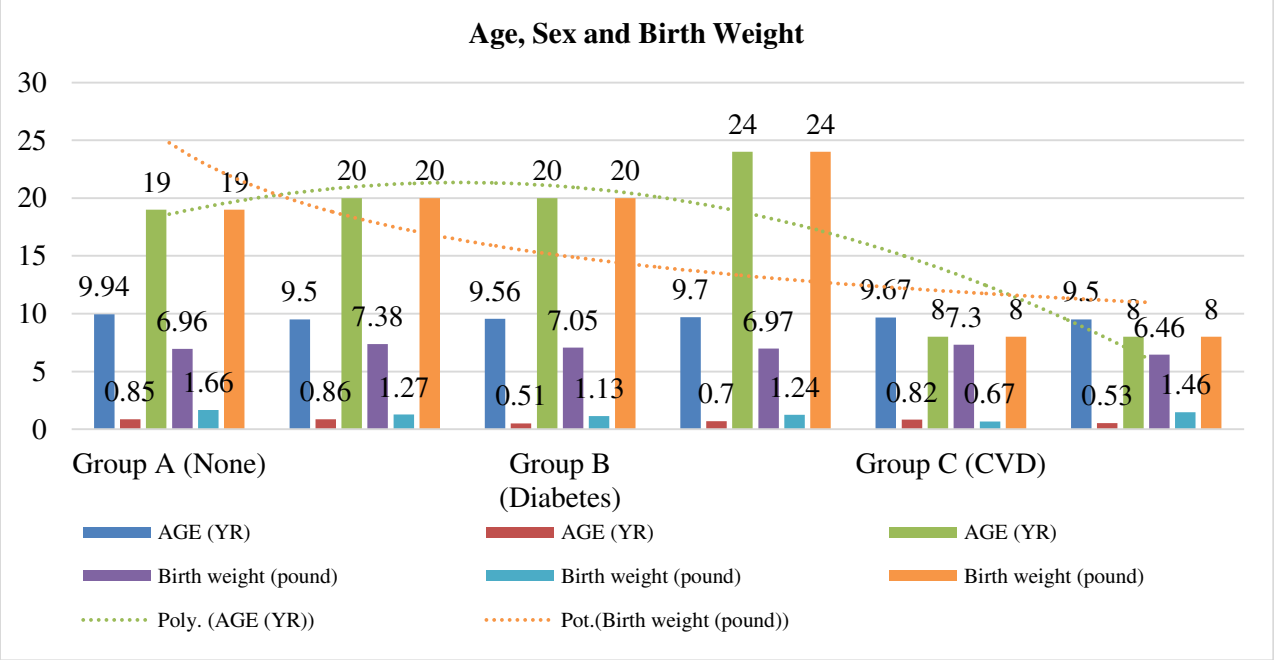
RESULTS:

Each of the three groups (A, B and C) consisted of forty-four children. The groups were formed on the basis of study protocol. Only 16 children came up with CHD family history without diabetes. Therefore, Group C has got only sixteen subjects.

Some parents were not interested to allow their children to participate in the study. Hence, the final group distribution was recorded to be Controls-39 children, Diabetes history – 44 children and CVD history – 16 children. The birth weights and mean ages of the children were analyzed and found statistically insignificant.

Table – I: Age sex and birth weight of children

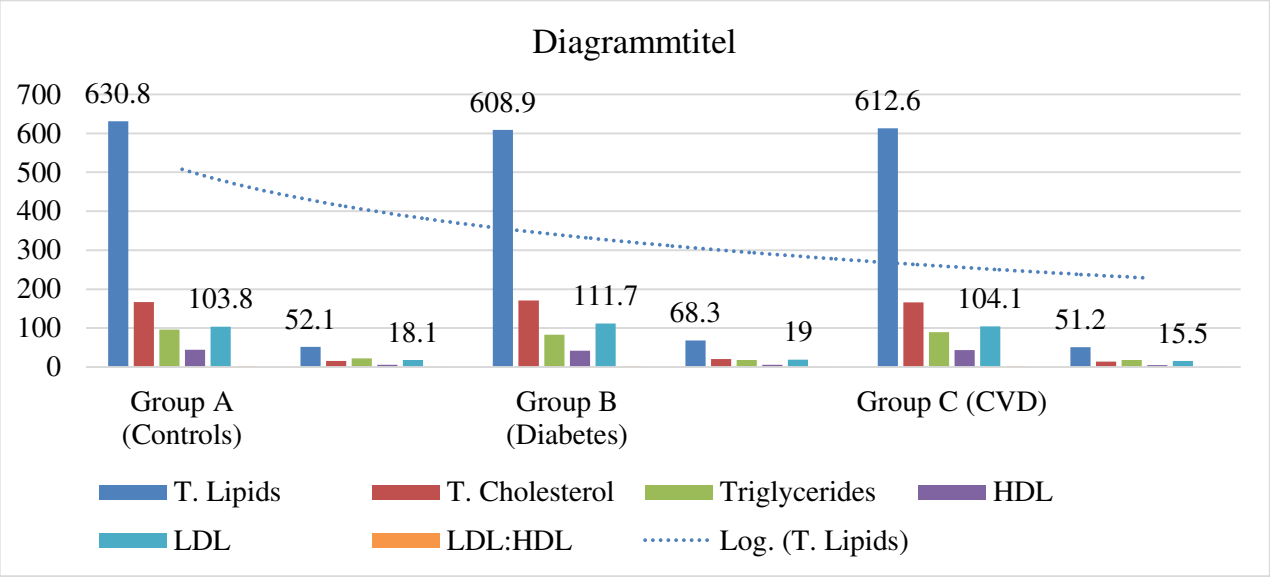
Age and Weight	Mean +/- SD / n	Group A (None)		Group B (Diabetes)		Group C (CVD)	
		Male	Female	Male	Female	Male	Female
AGE (YR)	Mean	9.94	9.5	9.56	9.7	9.67	9.5
	SD	0.85	0.86	0.51	0.7	0.82	0.53
	n	19	20	20	24	8	8
Birth weight (pound)	Mean	6.96	7.38	7.05	6.97	7.3	6.46
	SD	1.66	1.27	1.13	1.24	0.67	1.46
	n	19	20	20	24	8	8



The blood results obtained from the samples are presented in Table – II. Group B values for LDL were lower and for HDL were higher as seen against the other two groups (Group A and Group C). The triglyceride readings in control group were significantly higher. Table – III contains the fasting blood sugar and insulin (fasting) results. The children bearing the family history of CVD were having significantly higher readings for fasting blood glucose. The insulin values were CVD group were relatively higher but not touching the significance level. The readings for anthropometric characteristics are described in Table – IV. BMI readings were higher in the group with diabetes family history. Also, waist-circumference, arm-fat-percentage, mid-arm-circumference and skin thickness were observed to be higher in this group. Among these anthropometric variables, only BMI was statistically significant.

Table – II: Mean values for indicators of dyslipidemia according to family history

Dyslipidemia Indicators	Group A (Controls)		Group B (Diabetes)		Group C (CVD)	
	Mean	SD	Mean	SD	Mean	SD
T. Lipids	630.8	52.1	608.9	68.3	612.6	51.2
T. Cholesterol	167.1	15.7	170.7	20.5	166.2	14.2
Triglycerides	95.8	22.3	82.9	18.2	89.5	18
HDL	44.1	5.7	42.1	5.4	43.9	4.8
LDL	103.8	18.1	111.7	19	104.1	15.5
LDL: HDL	2.4	0.6	2.7	0.7	2.4	0.6



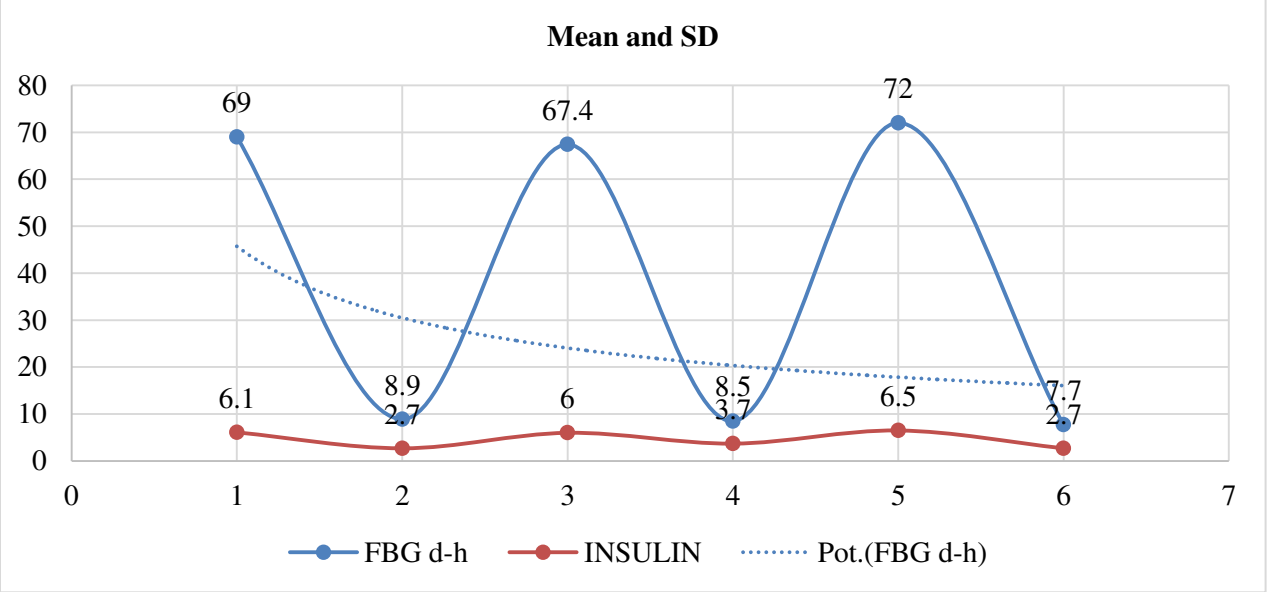
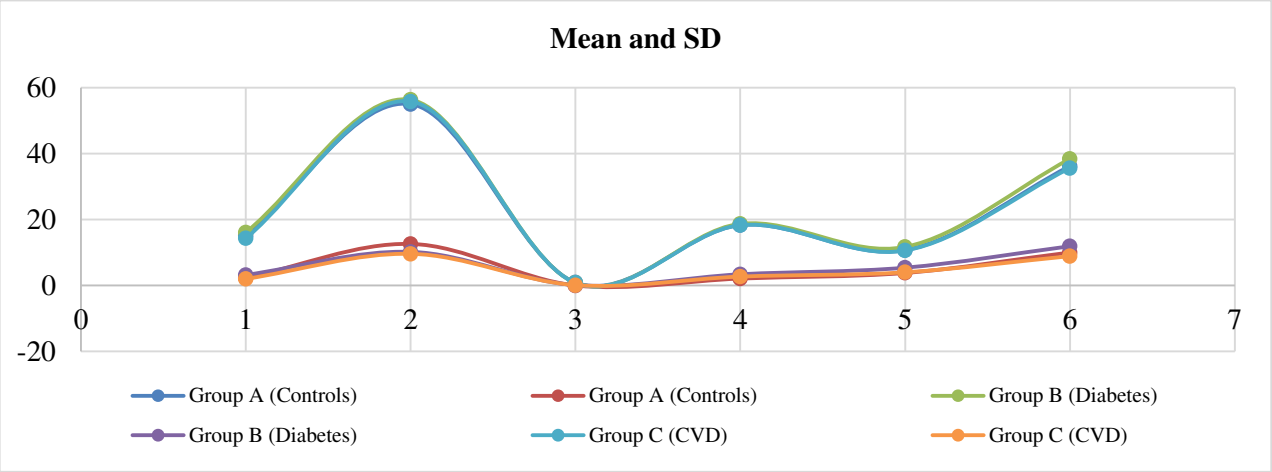


Table – IV: Mean values for obesity indicators according to family history

Obesity Markers	Group A (Controls)		Group B (Diabetes)		Group C (CVD)	
	Mean	SD	Mean	SD	Mean	SD
BMI	15.2	2.3	16.1	3.2	14.3	2
WAIST (cm)	55	12.6	56.3	10.2	55.8	9.6
WHR	0.9	0	0.8	0.1	0.8	0.1
MAC (cm)	18.3	2.1	18.7	3.4	18.3	2.7
SFT (mm)	10.7	3.8	11.7	5.4	10.6	4
ARM FAT (%)	36.2	10	38.4	11.9	35.6	8.9



The obesity indicators such as Subcutaneous Fat Tissue (SFT), BMI, Mid Arm Circumference (MAC), Arm-fat percentage and Waist perimeter were statistically significant in each case with a p value < 0.05 with insulin levels (fasting). The correlation of different anthropometric features with lipid profiles, LDL and HDL is provided in Table – V. Arm fat percentage was considered a high-risk factor for these values. NO significance was observed in cases of HDL, Triglyceride, and FBS. The children with high arm fat percentage group had significantly higher values of total glucose, total cholesterol, LDL to HDL ratio and LDL (P < 0.05 in each case).

Table – V: Correlation (Pearson) between obesity indicators and insulin

Indicators	r / P	T. Lipids	CHOL	LDL	LDL: HDL	INSULIN
BMI	r	0.038	0.083	0.112	0.117	0.21
	P	ns	ns	ns	ns	0.012
WAIST	r	0.028	0.043	0.08	0.1	0.231
	P	ns	ns	ns	ns	0.006
MAC	r	-0.001	0.083	0.097	0.064	0.271
	P	ns	ns	ns	ns	0.001
SFT	r	0.143	0.191	0.191	0.16	0.329
	P	ns	0.023	0.022	0.058	0
ARMFAT	r	0.236	0.246	0.23	0.2	0.285
	P	0.005	0.003	0.006	0.018	0.001

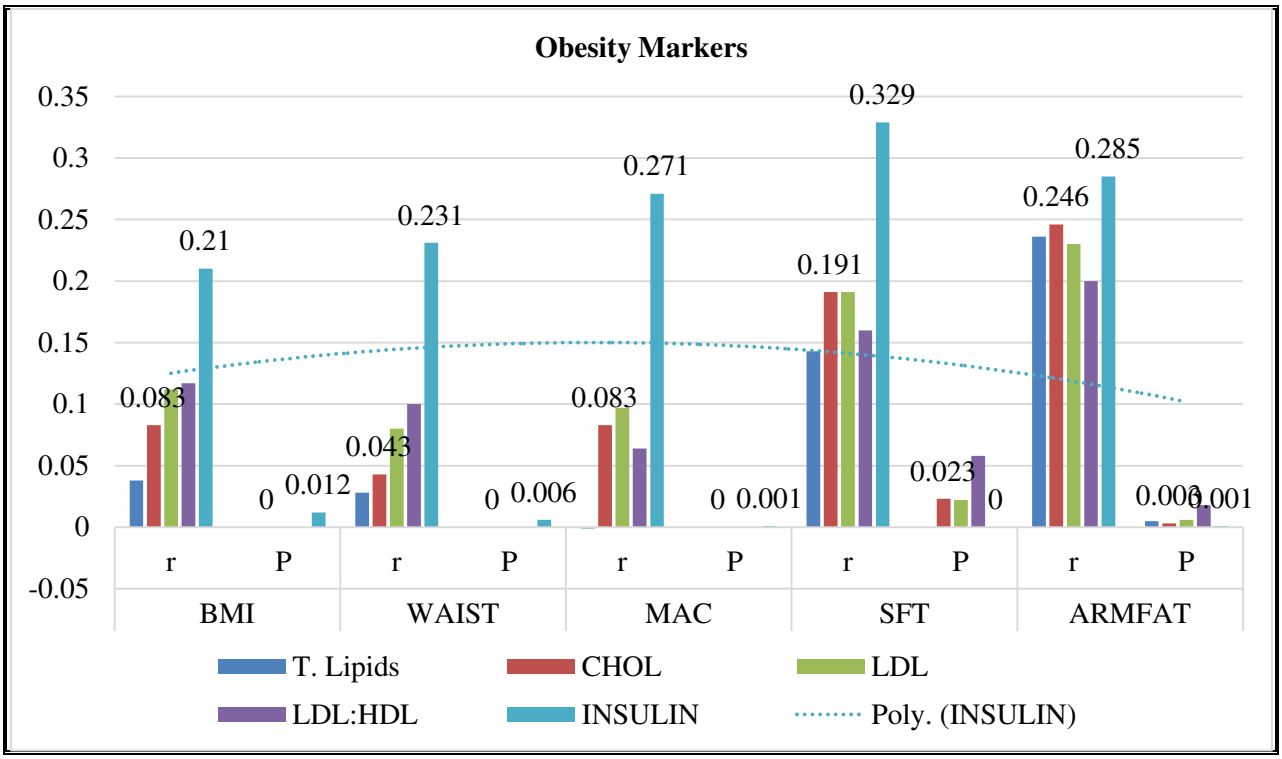


Table – VI shows the comparison of the children in respect of the physical activities and association with heart and diabetic issues. The children who spent their time sitting idle (not participating in outdoor games and physical activities) belonged to the CVD and diabetes groups. The values were higher but did not reach the significance level. The food pattern of the groups is described in Table – VII. The diabetic group members were consuming more meat and egg in their diet whereas CVD group members were seen with increased use of cereal and bread (Table – VII).

Table – VI: Mean values for indicators of physical activity level according to family history

Groups	Mean / SD	Weekly Reading Hours	Weekly Watching Hours	Weekly Running Hours
Group A (Controls)	Mean	14.8	12.6	8.6
	SD	6.8	6.5	4.4
Group B (Diabetes)	Mean	14.8	15.8	7.2
	SD	8.2	12.3	4.7
Group C (CVD)	Mean	17.1	11.2	6.6
	SD	8.6	7.5	4.4

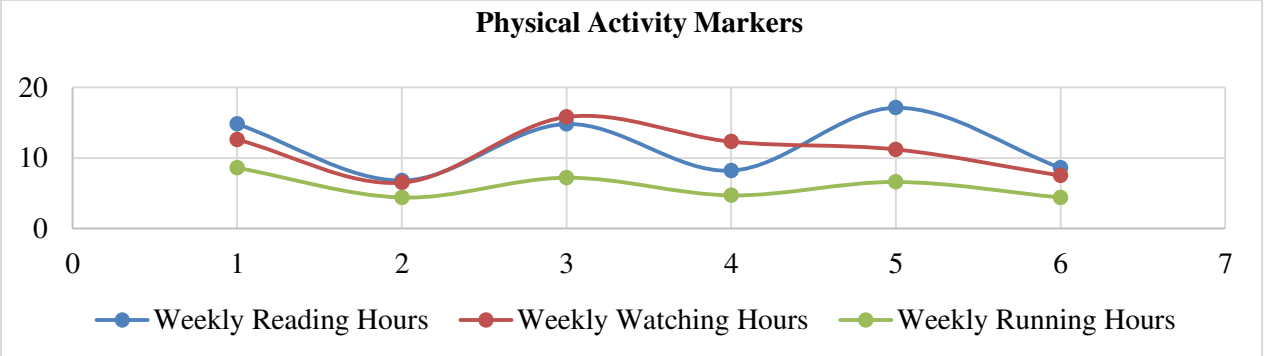
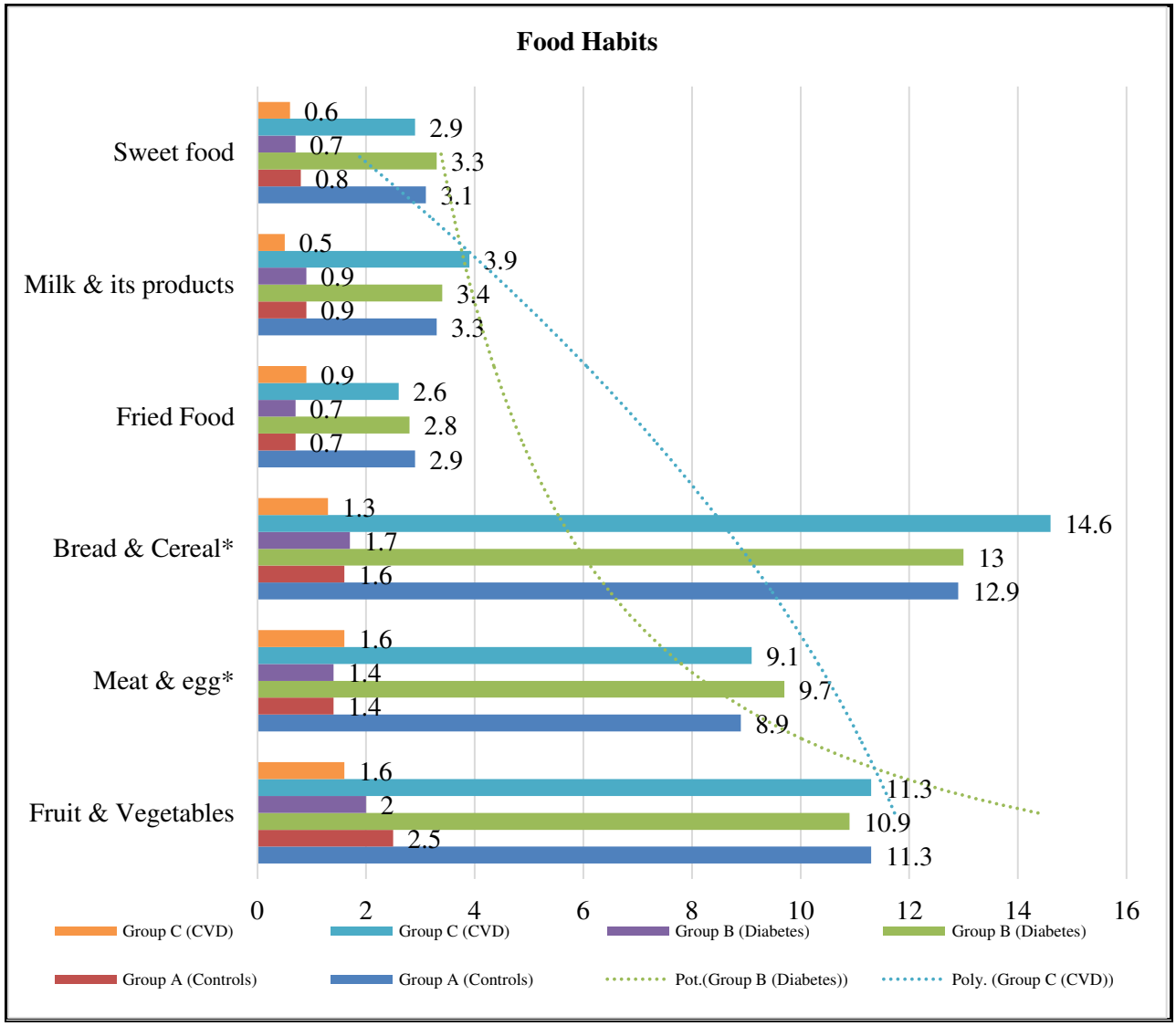


Table – VII: Food habits (mean frequency per week) according to family history

Food Habits	Group A (Controls)		Group B (Diabetes)		Group C (CVD)	
	Mean	SD	Mean	SD	Mean	SD
Fruit & Vegetables	11.3	2.5	10.9	2	11.3	1.6
Meat & egg	8.9	1.4	9.7	1.4	9.1	1.6
Bread & Cereal	12.9	1.6	13	1.7	14.6	1.3
Fried Food	2.9	0.7	2.8	0.7	2.6	0.9
Milk & its products	3.3	0.9	3.4	0.9	3.9	0.5
Sweet food	3.1	0.8	3.3	0.7	2.9	0.6



DISCUSSION:

The relationship between the family disease history and blood profiles of the children have been studied under different researches. The findings of these studies have concluded that family history is closely related to theses variables and depend upon other demographic factors such as sex, age and environment [3 – 4, 8 – 17]. A major study on the topic has found the strong association of inherited CVD in children. The age factor is considered important. The

cholesterol levels in the children are not necessarily depicting the family history completely [18]. A study conducted in Canada revealed that association of parental CHD can be overcome by some ecological factors [20].

Our study delivered that the lipid and glucose profiles of the children were likely to vary depending upon the genetic makeup. Genetic association of diabetes was observed as a major cause of corpulence in the children. The biochemical profiles of the children tend to shift to the identical profiles of their parents due to similar food patterns and activity routines of the parents. The biochemical factors are closely related to the dietary pattern of the individual. For instance, the diabetic group was observed to be consuming more egg and meat in their routine as compared to control group.

Obesity indicators are always strong predictor of abnormal levels of insulin and lipids in all age groups [8 – 9, 21 – 23]. Many studies argued that active life style of the victim had considerably reduced the risk of developing genetic heart or diabetic diseases [24]. To counter these issues, awareness should be given to the adoption of healthy lifestyle irrespective of the physical attributes and genetic association. The family members should boost and improvise the ways for healthy living among their children. Anthropometric features should be measured at regular intervals to put a check on the potential risk factors and act accordingly to eliminate them.

CONCLUSION:

The risk factors associated with cardio vascular disease and diabetes inherited by the children from their families is well known and can be checked by the percentage of fat in the body. Therefore, in case of absence of previous family history in some cases, arm fat is considered as an independent measure of the risks factors of the said disease among children.

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