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PREVALENCE OF METABOLIC SYNDROME;
ITS RISK FACTORS AND VIRAL HEPATITIS B & C IN UNDERPRIVILEGED SUBURBAN POPULATION OF LAHORE, PAKISTAN.

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ABSTRACT: Morbidity and mortality due to cardiovascular disease (CVD) and type-2 diabetes mellitus has been increased in our country. Obesity and overweight are indicators of risk for CVD and diabetes mellitus. **Study Design**: Cross sectional study. **Setting:** Population of four suburban villages 25-30 km from Lahore i.e. Kacha, Dera Chahal, Shadawal and Samsani Khui. **Objectives:** The population was screened for obesity, hypertension, diabetes, dyslipidemia. and hepatitis B & C virus infection. The risk factors of metabolic syndrome were determined. **Methods:**4319 subjects both male and female were included in this study, **Results:** Total 4308 subjects had complete data for analysis**,** of these 1793(41.62%) were males and 2515(58.38%) females. Mean age of male subjects was 33.7 ± 16.4 and of females 34.8 ± 14.8. Smokers of cigarette and huqqa were 36.98% males and 3.31% females. More males 945(52.7%) than females 766(30.45%) who received some education. Mean values were significantly higher in females for waist circumference ($p<0.00$), hip circumference ($p<0.001$), BMI ($p<0.00$) systolic BP ($p<0.00$), diastolic BP ($p<0.00$), glucose level ($p<0.015$) and HDLC ($p<0.00$). Mean values of waist hip ratio (W-H ratio), total cholesterol, triglycerides, LDL-C and VLDL-C were comparable in both genders. Impaired random blood glucose was found in more 156(6.2%) females than in 86(4.8%) males. More male population was found infected with hepatitis B (6.03%) and hepatitis C (13.61%) viruses than females i.e. hepatitis B (3.3 %) and hepatitis C (11.84%). Overall metabolic syndrome was found significantly higher 68.13% with IDF definition and 67.53% with ATP-NCEP-III-1, than 55.40% with American Heart Association and 40.43% with WHO. Prevalence of metabolic syndrome was significantly higher in females 55.63% than males 44.36%. **Conclusion:** Metabolic syndrome risk factors i.e. hypertension, obesity, hyperlipidemia and impaired glucose were far more common in women compared to men.

Key words: Metabolic Syndrome, Risk Factors, Viral Hepatitis B & C.

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INTRODUCTION

Obesity and overweight have a rising trend worldwide. This epidemic appears to be more in developing countries especially in poor socioeconomic groups. Body mass index and abdominal obesity have been reported as independent risk factors for diabetes mellitus, metabolic syndrome and coronary heart disease.[1,2] Epidemiological and clinical studies have shown that high intake of saturated fats, trans hydrogenated fats and dietary cholesterol increase blood cholesterol, triglycerides, low and very low density lipoprotein cholesterol and insulin resistance which leads to arterial lesions and high blood pressure.[3] A condition which is called metabolic syndrome developed by increase in BMI, blood pressure, blood glucose, triglycerides and decrease in HDL cholesterol levels, is associated with high risk of cardiovascular disease (CVD) and diabetes mellitus, widely prevalent in Asia.[4] Smoking has also major health effects which include an increased risk in hypertension, lung cancer, and cardiovascular diseases.[5]

Epidemic of obesity causes morbidity and mortality from diabetes and CVD in developing countries, which is expected to increase by 120% for women and 137% for men[6], substantially greater than from developed countries (29% and

48%, respectively).

In future, developing countries will have 70% of new incident cases of diabetes.[7] Among ten leading countries with diabetes, five are in Asia.[8,9] World over, the diabetes mellitus type 2 patients are expected to increase up to 366 million by 2030, of which 298 million will be in developing countries of Middle East and North Africa, South Asia, and sub-Saharan Africa.[10] By 2025, Pakistan will rank in fourth place with 14.5 million diabetics, whereas India will rank first with 57 million diabetics and China in second place with 38 million diabetics.[10] In 2006, there were 6.9 million diabetics in Pakistan according to International Diabetes Federation.[11] In Pakistan there is an increasing trend of obesity, dyslipidemia, hypertension and impaired glucose tolerance, all referred as metabolic syndrome leading to diabetes and CVD. Since, metabolic syndrome is a long term process that starts in early life and affect later as type 2 diabetes and CVD their complications and its early management will have a significant impact on the prevention of both diabetes and CVD.[12] High incidence of diabetes and CVD in south Asians could be due to potential force of metabolic syndrome. The features of metabolic syndrome can be present up to 10 years preceding type 2 diabetes and CVD.[13]

In developing countries an urgent need is to establish health policies and mass intervention programs to tackle increasing burden of obesity, the metabolic syndrome, T2DM, and CVD. A marked change in the life style and diet has increased unusual tendency to develop diabetes mellitus type 2 and coronary heart disease in our community. Due to the morbidity, mortality, it will be beneficial to identify individuals who are at higher risk for developing the diabetes mellitus type 2 and coronary heart disease and may benefit from intensive prevention strategies. In addition, viral hepatitis due hepatitis B and C viruses also another emerging threat to heath of masses all over the country. Pakistan is ranked amongst the most affected and at risk populations for these infections.[14,15] In order to prevent and reduce consequences of these non-communicable and communicable diseases the Zeenat Hussain Foundation has conducted a survey of four villages i.e. Kacha, Dera Chahal, Shadawal and Samsani Khui. The population was screened for obesity, blood pressure, glucose level, lipid profile and for hepatitis B & C virus infection. The risk factors of metabolic syndrome were also determined in the studied population.

SUBJECTS AND METHODS

It was a cross sectional study conducted in four suburban villages 25-30 km from Lahore i.e. Kacha, Dera Chahal, Shadawal and Samsani Khui. Adult subjects of both genders were selected from each village using convenient random sampling technique. A total of 4319 subjects were included in this study, i.e. 1105 subjects from Kacha village (458 males and 647 females), 1038 subjects from Dera Chahal village (420 males and 618 females), 1021 subjects from Shadawal village (446 males and 575 females) and 1155 subjects from Samsani Khui (465 males and 690 females). The subjects were briefed about the survey importance that it will help in diagnosing the silent killer diseases at an early stage before irreversible complications set in. After taking an informed consent, the subjects were interviewed for demographic information i.e. gender, age, education level, occupation, annual income and smoking. Clinical examination was carried out which included measurement of blood pressure (systolic & diastolic), weight (kg) and height (m) to determine BMI (kg/m2). Systolic blood pressure was first taken from the radial pulse by palpatory method. Auscultatory blood pressure was measured on both left and right arms. Those with raised blood pressure had their blood pressure checked 3-4 times on different days before being declared as hypertensive. Height and weight were measured with Hospital and Home Care radial type of Height and Weight Measurement machine Model No ZT-120. BMI (25-29.9) was considered over weight and BMI ≥30 as obese. Waist was measured as the point midway between the iliac crest and the costal margin (lower rib). Hip was measured as the widest circumference over the buttocks and below the iliac crest.

Blood specimen was collected at random state, for determination of biochemical parameters and detection of Hepatitis B and C Viruses. Blood samples were transported to the laboratory in an icebox and kept in a refrigerator at 4°C. Blood glucose level was measured by glucose hexokinase[16], serum cholesterol by CHOD-PAP[17], triglyceride with GPO-PAP[18] methods and HDL-C by homogeneous enzymatic assay (direct method without precipitation).[19] VLDL and LDL were calculated by formula. The subjects with random blood glucose level <140mg/dl were considered as non-diabetic and random blood glucose >140mg/dl diabetic. Controls precinorm as normal control and precipath as abnormal control were used. Hitachii 912 autoanalyser was used. All biochemical test reagent kits used were from Roche Diagnostic Co. Second generation kit HBsAg for screening test of Hepatitis B virus (Abbott Co.) and third generation kit Anti HCV (Abbott Co.) screening test for Hepatitis C virus were used. Viral assay was carried out on Achhetct analyser (Abbott Co.).

The metabolic syndrome was assessed by the presence of any three out of the five conditions according to following four different definitions of metabolic syndrome i.e. American Heart Association[20], International Diabetes Federation (IDF)[21], National cholesterol Education Program Adult Treatment Panel III-1(NCEP)[22] and WHO.[23] Statistical analysis was done using SPSS programme. The results were expressed as mean± standard deviation for continuous variables and expressed as numbers and percentages for categorical data. Differences between continuous data were analyzed by independent student's t-test and categorical data by chi square test. The p-value was used to compare the different results, p-value <0.05 was considered as significant.

RESULTS

Total 4308 subjects from four villages who had complete data were included for analysis, of these 1793(41.62%) were males and 2515(58.38%) females. Anthropometric, clinical and biochemical profile of the total subjects showed mean age of male subjects was 33.7 ± 16.4 and of females 34.8 ± 14.8. Smokers of cigarette and huqqa were 36.98% males and 3.31% females. Higher number of males 945(52.7%) than females 766(30.45%) who received primary, high school, college or university education. Mean values were significantly higher in females for waist circumference (p<0.00), hip circumference (p<0.001), BMI (p<0.00) systolic BP (p<0.00), diastolic BP (p<0.00), glucose level (p<0.015)

Organization	Metabolic syndrome risk factors				
	Waist Circumference/BMI	Triglyceride Level	HDL-C Level	Blood pressure Value	Fasting Glucose Level
1. American Heart Association/ National Heart, Lung, and Blood Institute	Men: 0≥102cm (40in) women: ≥88cm (35in)	≥150 mg/dl	Men: <40 mg/dL Women: <50 mg/dL	≥130/85mm Hg	≥100 mg/dL
2.InternationalDiabetes (IDF), Federation-WC specific for Asians	Men: ≥94cm (37in)* women: ≥80cm (31in)	≥150 mg/dl	Men: <40 mg/dL Women: <50 mg/dL	≥130/85mm Hg	≥100 mg/dL
3.National cholesterol Education Program Adult Treatment Panel III-1 Modified as per Asia-Pacific	Men: ≥90cm (35in) Women: ≥80cm (31in)	≥150 mg/dl	Men: <40 mg/dL Women: <50 mg/dL	≥130/85mm Hg	≥110 mg/dL
4.World Health Organization. Modified for Asians	Waist to hip ratio Men: >0.89 Women: >0.81 or BMI >23 kg/m^2	≥150 mg/dl	Men: <35 mg/dL Women: <39 mg/dL	≥140/90 mm Hg	≥1l0 mg/dL*

** Mandatory while include at least two other components.*

and HDLC (p<0.00). Mean values of waist hip ratio (W-H ratio), total cholesterol, triglycerides, LDL-C and VLDL-C were comparable in both genders. Impaired random blood glucose was found in more 156(6.2%) females than in 86(4.8%) males. More male population was found infected with hepatitis B (6.03%) and hepatitis C (13.61%) viruses than females i.e. hepatitis B (3.3 %) and hepatitis C (11.84%). In few males and females the results for HbsAg and Anti HCV were in grey zone (Table-I).

All clinical and biochemical parameters were significantly high in the subjects with metabolic syndrome showing dyslipidemia. In females, the mean values were significantly high for systolic BP (p<0.00), diastolic BP (p<0.00), waist circumference (p<0.00), BMI (p<0.00) and HDLC (p<0.00), whereas, in males mean value for triglyceride (p<0.00) was significantly high. Mean values of waist hip ratio and glucose were comparable in both genders Table-II.

Overall metabolic syndrome (those who had three or more than three risk factors) was found significantly higher 68.13% with IDF definition and 67.53% with ATP-NCEP-III-1, than 55.40% with American Heart Association and 40.43% with WHO. Table-III. Prevalence of metabolic syndrome was significantly higher in females 55.63% than males 44.36%.

The number of subjects with no or zero component of metabolic syndrome was significantly higher 623(14.5%) with WHO and 382(8.9%) with American heart Assoc. definitions of metabolic

Parameters	Male N= 1793	Female N=2515	Total N=4308	P value
	Mean sd	Mean sd	Mean sd	
Age (yrs)	33.7 ± 16.4	34.8 ± 14.8	34.3 ± 15.5	
Education n(%) Illiterate Literate (Primary, high school, college, univ)	684(38.14%) 945(52.7%)	1454(57.81%) 766(30.45%		
Glucose level n(%) Normal(Random blood glu <140mg/dl) Impaired(Random blood glu>140mg/dl)	 1707(95.2%) 86(6.6%)	 2359(93.8%) 156(9.6%)	 4066(94.4%) 242(5.6%	
Waist circumference (WC) (inches)	32.0 ± 3.6	32.41 ± 3.9	32.24 ± 3.79	0.00
Hip circumference (inches)	36.0 ± 3.6	36.06 ± 3.96		0.001
W–H ratio	0.89 ± 0.06	0.89 ± 0.60	0.89 ± 0.59	0.617
Body mass index (BMI) (kg/m^2)	22.99 ± 4.08	24.82 ± 5.39	24.06 ± 4.97	0.00
Smoking status: Cigarette, Huqqa n (%)	663(38.98%)	82(3.3%)		
Blood Pressure: Systolic (mm Hg) Diastolic (mm Hg)	 120.58 ± 13.8 79.2 ± 9.2	 122.69 ± 17.99 80.28 ± 10.99	 121.89 ± 16.33 79.82 ± 10.28	 0.00 0.00
Glucose (mg/dl)	93.88 ± 51.4	96.34 ± 58.11	95.31 ± 55.43	0.015
Total cholesterol (mg/dl)	162.4 ± 39.7	176.6 ± 40.39	170.70 ± 40.73	0.319
Triglycerides (mg/dl)	194.8 ± 143.0	193.72 ± 137	194.18 ± 139.55	0.61
HDL-C (mg/dl)	40.59 ± 10.9	46.97 ± 13.	44.31 ± 12.6	0.00
LDL-C (mg/dl)	83.15 ± 31.5	91.14 ± 31.95	87.81 ± 31.98	0.305
VLDL-C (mg/dl)	39.0 ± 28.7	38.76 ± 27.45	38.86 ± 27.96	0.564
HbsAg: n(%) Positive Negative Gray zone Anti HCV: n(%) Positive Negative Gray zone	108(6.03%) 1671(98.76%) 13(0.73%) 244(13.61%) 1500(83.37%) 49(2.73%)	83(3.3%) 2411(95.9%) 20(0.8%) 286(11.84%) 2035(84.26%) 94(3.98%)		

Table-I. Anthropometric, Clinical and Biochemical profiles of the subjects:

syndrome, whereas it was 190(4.4%) with IDF and 219(5.1%) with NCEP-ATP-III-1. The metabolic syndrome due to three, four or five risk factors was found significantly higher in females than males with all four definitions considered Table-IV.

Age specific distribution of the subjects with metabolic syndrome showed that maximum prevalence of metabolic syndrome in males 264(20.3%) in age group <20 and 332(25.5%) in 20-29 age group. Maximum prevalence of metabolic syndrome in females was seen 386(23.6%) in 30-39 age group and 332(20.3%) in 40-49 age group. Metabolic syndrome prevalence reduced after 50 yrs of age in both genders Table-V.

Overall in metabolic syndrome subjects the commonest lipid abnormalities were reduced HDL-C and hypertiglyceridemia in both genders. Among females elevated BMI, waist circumference and hypertension were most prevalent abnormalities. Elevated blood glucose (6.6% and 9.6%) was the least common abnormality in both genders. Components other than metabolic syndrome i.e. total cholesterol and LDL-C were also elevated in more females than males Table-VI.

Variable	Male Mean sd	Female Mean (sd)	P value
Age (yrs)	33.21 ± 16.5	33.11 ± 14.27	0.00
BP: Sys Diast	119.94 ± 12.66 78.87 ± 8.8	121.77 ± 17.52 79.77 ± 11.06	0.00 0.00
WC (cm)	31.82 ± 3.5	32.29 ± 4.04	0.00
Waist-Hip ratio	0.883 ± 0.056	0.888 ± 0.063	0.714
BMI ($kg/m^{2)}$	22.83 ± 4.01	24.78 ± 5.72	0.00
Glucose (mg/dl)	87.54 ± 29.12	87.61 ± 36.89	0.625
TG (mg/dl)	164.73 ± 99.97	148.97 ± 84.54	0.00
HDL-C (mg/dl)	42.39 ± 10.45	49.91 ± 13.15	0.00

Table-II. Gender difference in clinical and biochemical parameters of the subjects with metabolic syndrome

MS Definition	N	Percent
IDF	2935	68.13
American Heart Association	2387	55.40
ATP-NCEP-III-1	2910	67.53
WHO	1742	40.43

Table-III. Prevalence of metabolic syndrome according to different definition criteria:

Factors	American heart Assoc.		IDF		NCEP-ATP-III-1		WHO	
	Male	Female	Male	Female	Male	Female	Male	Female
0	105(5.9%)	277(11%)	45(2.5%)	145(5.8%)	49(2.7%)	170(6.8%)	214(11.9%)	389(15.5%)
1	219(12.2%)	414(16.5%)	140(7.8%)	331(13.2%)	143(8%)	298(11.8%)	362(20.2%)	550(21.9%)
2	416(23.2%)	491(19.5%)	306(17.1%)	407(16.2%)	319(17.8%)	420(16.7%)	445(24.8%)	607(24.1%)
3	467(26%)	489(19.4%)	420(23.4%)	495(19.7%)	395(22%)	471(18.7%)	375(20.9%)	417(17.6%)
4	293(16.3%)	362(14.4%)	422(23.5%)	456(18.1%)	385(21.5%)	422(23.5%)	241(13.4%)	298(11.8%)
5	293(16.3%)	412(18.4%)	460(25.6%)	682(27.1)	502(27.9%)	735(29.2%)	156(8.6%)	255(10.1%)

Table-IV. Frequency of risk factors of metabolic syndrome in study subjects according to different definition criteria.

Age classes	All subjects: (n=4308) N (freq)	All MetS: (n=2935) N(freq)	Males: MetS (n=1302) N (freq)	Female: MetS (n=1633) N (freq)
<20	1023(23.7%)	491(16.7%)	264(20.3%)	227(13.9%)
20-29	954(22.7%)	567(19.3%)	332(25.5%)	235(14.4%)
30-39	824(19.1%)	602(20.5%)	216(16.6%)	386(23.6%)
40-49	637(14.8%)	522(17.8%)	190(14.6%)	332(20.3%)
50-59	403(9.4%)	353(12%)	113(8.7%)	240(14.7%)
≥60	467(10.8%)	400(13.6%)	187(14.4%)	213(13%)

Table-V. Age adjusted distribution of subjects with metabolic syndrome:

Metabolic syndrome and other variables	Male N=1302	Female N=1633
BMI (>23kg/m^2)	518(39.78%)	1105(67.66%)
Hypertension(≥130/85mmHg)	306(23.5%)	647(39.6%)
WC (M≥37in, F≥31in)	236(18%)	1472(90.14%)
Glucose(>140mg/dl)	86(6.6%)	156(9.6%)
TG (>150mg/dl)	879(67.5%)	1165(71.3%)
HDL-C: M<40, F<50mg/dl)	1212(93%)	1326(81.2%)
Total Cholesterol (>200mg/dl)	286(21.96%)	652(39.92%)
LDL-C (>130mg/dl)	133(10.2%)	285(17.5%)

Table-VI. Gender wise frequency of metabolic syndrome and other variables

DISCUSSION

Present study revealed significantly considerable prevalence of obesity, impaired glucose level, hypertension, dislipidemia and hepatitis B and C infection. The mentioned metabolic parameters have already been listed as the risk factors of metabolic syndrome.[1,2]

Presently, the values of waist circumference were significantly high in (90.14%) females who were (67.66%) overweight and obese as well referring abdominal or central obesity. Obesity has been considered to be the risk factor for type-2 diabetes, metabolic syndrome, and cardiovascular disease.[1,2] Obesity in terms of waist circumference in Pakistani population was found to be 46-68%[24], comparable with results of present study,

Abdominal obesity and insulin resistance has strong correlation.[25] A survey in Pakistan reported impaired glucose level in the urban verses rural areas 6.3% in men and 14.2% in women against 6.9% in men and 10.9% in women respectively.[26] In present study similar results of impaired glucose level were observed in 6.6% males and 9.6% females,. In our study high triglycerides level was found in 69.64% subjects which is higher than 27-54%, whereas low HDL-C in 86.47%, which is bit higher than 68-81%, our results are not in agreement reported earlier in Pakistan.[24]

The results showed high prevalence of metabolic syndrome risk factors. Metabolic syndrome was determined with four different criteria i.e. American Heart Association, International Diabetes Federation (IDF) used WC specific for Asians WC, National cholesterol Education Program Adult Treatment Panel III-1(NCEP) modified as per Asia-Pacific and WHO modified for Asians. A significantly high metabolic syndrome prevalence rates were observed (68.13%) in this study with IDF definition and with ATP-NCEP-III-1(67.53%). It was observed that maximum subjects having metabolic syndrome were spotted with IDF and NCEP criteria. On the contrary, a low prevalence of metabolic syndrome has been reported in Philippines, Malaysia, India, Turkey, Iran, Venezuela and Brazil were 19%, 24.2%, 28.8%, 33.4%, 33.7%, 31.2% and 25.4%, respectively[27],

and in earlier reports.[24] However, our results of metabolic syndrome prevalence are comparable with an Indian study which observed prevalence 60.77%.[28]

Present study found prevalence of metabolic syndrome significantly higher in females 55.63% than males 44.36%. A study in Pakistan reported prevalence of metabolic syndrome 50%, whereas prevalence of metabolic syndrome in Pakistan according to different definitions ranged from 18-46%.[24] A community based study from India has also reported significantly higher rates of metabolic syndrome in women (52.2 %) compared to men (34.2 %).[29] Most of the studies worldwide and in Indian subcontinent have reported high prevalence of metabolic syndrome in women.[30-33] Explanation for higher prevalence may be more stringent cutoffs employed in women for waist circumference and HDL-C. One of the possible explanations for the higher prevalence of metabolic syndrome in our women was abdominal obesity as the present study showed that 90.14% of women had large waist circumference. The waist circumference reflected abdominal fat[34], which was in agreement with our observation.

It has been shown that low HDL–cholesterol levels and high LDL cholesterol were associated with insulin resistance.[35] It has also been reported that elevated triglyceride levels in most individuals more strongly indicate diabetes than vascular risk.[36] Our subjects with metabolic syndrome also had low HDL–cholesterol, elevated serum triglycerides and high LDL–cholesterol levels, our results are in agreement with the idea that they may have risk of diabetes.

In our study maximum prevalence of metabolic syndrome was present in young males of age groups <20 and 20-29, in females maximum prevalence was in 30-39 and 40-49 age groups and reduced in both genders after age of 50yrs. These results are comparable to a previous report.[37] Higher prevalence of metabolic syndrome in younger age is alarming, as it intimates a more prolonged exposure to risk factors associated with metabolic syndrome.

An incidence of 2.5% of CVD and 1.1% of T2D has been reported in those with one component of the MS, while in those with four or more components of the syndrome developed 15% CVD and 18% T2D.[38] Another statement reiterated that patients with MS have two and five times the risk of developing CVD and T2D, respectively, over the next 5 to 10 years, as compared to individuals without MS.[39] Present study observed very high prevalence of metabolic syndrome with all the known classical risk factors present, to be significant predictors for developing cardiovascular disease and type-2 diabetes in future. However, some authors/clinicians are not in agreement with formal diagnosis of metabolic syndrome concept which is seldom made and the condition is rarely included in guidelines for the treatment and prevention of cardio metabolic disease. Rather it should be focused on identifying mechanisms underlying the clustering of metabolic syndrome risk factors. It has been recommended that metabolic syndrome be considered a useful educational concept with little practical utility as a diagnostic or management tool.[40] Despite the criticisms, the metabolic syndrome information can be used by clinicians a tool to prevent obesity, a leading cause of insulin resistance ultimately will help in delaying type-2 diabetes and cardiovascular disease in future.

In communicable diseases, viral hepatitis is a serious health problem affecting approximately two billion people worldwide. A nationwide survey in Pakistan observed overall prevalence of hepatitis B surface antigen and anti-hepatitis C virus of 2.5% and 4.8% respectively. Risk factors, lacking in education, poor socioeconomic status, meager hygienic conditions, poor sanitation, shaving at the barber, nose piercing, multi dose vials, unnecessary injections and reuse of syringes have also an influence in the prevalence of hepatitis B and C.[41] On the contrary, our study demonstrated high prevalence of hepatitis B (6.03%) and hepatitis C (13.61%) viruses in males and in females hepatitis B (3.3 %) and hepatitis C (11.84%). However, our results are comparable

with prevalence of hepatitis B (2.7 %) and hepatitis C (23.8%) in a rural population of Rahim Yar Khan, Pakistan.[42] Among different causes of high prevalence of these viruses in our community were lack of education, poor hygiene, sewage mixed drinking water and sanitation issues.

CONCLUSION

This study found metabolic syndrome risk factors i.e. hypertension, obesity, hyperlipidemia and impaired glucose level far more common in women compared to men. Village women who had already multiple pregnancies were housebound spending inactive life, also at increased risk of type-2 diabetes and cardiovascular disease. Reduced physical activity of women caused obesity, happened due to urbanization as no fields left to harvest the crop and no taking of food long way for farmers. In contrast men are not restricted they are mobile, leave house for their jobs and have leisure time to sit around in the teashops or under trees to socialize with their friends. The women should increase their physical activity and be encouraged to work for home based industry to combat for their health and poverty. High prevalence of hepatitis B and hepatitis C viruses was observed. Responsible factors were possibly lack of education, poor socioeconomic status, unavailability of clean drinking water, poor hygienic conditions and poor sanitation

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Not even our troubles."

Monsieur Verdoux 1947

AUTHORSHIP AND CONTRIBUTION DECLARATION

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