Original article:

Study on prevalence of hyperuricemia & microalbuminuria among pre-hypertensives and their relation

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Abstract

Introduction: Hyperuricemia is an independent risk factor for kidney dysfunction in pre-hypertensive patients. Various findings suggest that uric acid is an inflammatory factor and may have a role in endothelial dysfunction and act as a mediator of diabetic nephropathy.

Methodology : Patients with overt nephropathy as evidenced by positive dipstick test for albumin in urine or spot Albumin Creatinine ratio>300mg/gm of creatinine, conditions leading to Albuminuria like pregnancy,urinary tract infection,congestive cardiac failure,acute stressful illness like fever due to any cause, myeloproliferative or lymphoproliferative disorders or H/O taking medications which may increase the serum uric acid levels like diuretics, ethambutol, pyrazinamide, levodopa, nicotinic acid cyclosporine & alcohol, ischemic changes in ECG and regional wall motion abnormality in echocardiography.

Results: Among normtensive male subjects, with normal urinary ACR, 35cases had normal serum uric acid level, while 1 cases had high serum uric acid.Among normotensive female with normal urinary ACR,9 cases had normal s. uric acid while 1 case had high s. uric acid level. Among normotensive male subjects, with microalbuminuric range urinary ACR, no case had normal serum uric acid level, while 2 cases had high serum uric acid.Among normotensive female no cases hadmicroalbumonuric range urinary ACR.

Conclusion: This study showed that microalbuminuria was associated with a greater probability of hyperurecaemia in both male and female patients with prehypertension. Majority of prehypertensive subjects were between 41-50years age group, So they are the best target population for screening of hypertension. Nearly half of the prehypertesives were either overweight or obese.

Introduction:

Hyperuricemia is an independent risk factor for kidney dysfunction in pre-hypertensive patients. Various findings suggest that uric acid is an inflammatory factor and may have a role in endothelial dysfunction and act as a mediator of diabetic nephropathy. On the other hand, albuminuria is considered as the predicator of early stages of diabetic nephropathy. We investigated the association between hyperuricemia and albuminuria in patients with pre-hypertension. This study evaluated the association between serum uric acid & urinary albumin to creatinine ratio (ACR) among pre-hypertensive patients and also explored the relation between normoalbuminuria (ACR <30ug/ mg), microalbuminuria (ACR between 30µg/mg & 299 µg/mg) with serum uric acid levels.

Materials and Methods:

STUDY POPULATION: The study was carried out in 50 pre-hypertensive subjects (case) and 50 normotensive subjects(control). Both groups were matched for age & sex.

STUDY AREA: The study was performed at IPGME&R, Kolkata, in the Department General Medicine. The subjects were selected for study from Medicine OPD and indoor.

STUDY DESIGN: It was an observational cross-sectional comparative hospital based study.

SAMPLE SIZE: A total of 100 subjects comprising of 50 pre-hypertensive and 50 normotensive subjects

SAMPLE DESIGN:

Inclusion Criterion: Non-diabetic,non-hypertensive subjects with their BP in pre-hypertensive range were included in the study. For control group normotensive subjects were taken.

Exclusion Criteria: Patients with overt nephropathy as evidenced by positive dipstick test for albumin in urine or spot Albumin Creatinine ratio>300mg/gm of creatinine, conditions leading to Albuminuria like pregnancy,urinary tract infection,congestive cardiac failure,acute stressful illness like fever due to any cause, myeloproliferative or lymphoproliferative disorders or H/O taking medications which may increase the serum uric acid levels like diuretics, ethambutol, pyrazinamide, levodopa, nicotinic acid cyclosporine & alcohol, ischemic changes in ECG and regional wall motion abnormality in echocardiography.

Study procedure:

Over one and half year period, this observational cross sectional case control study was performed in subjects, whose B.P was found to be within pre-hypertensive range (SBP between 120-139 & or DBP between 80-89 mm of Hg) attending the medical outpatient department and those admitted to the medicine ward.Among these patients who had DM,IHD ,proven cases of renal diseas,patients with conditions leading to urinary albumin excretion like pregnancy, UTI, CHF,acute stressful illness & those with myelo or lympho proliferative diseases or taking alcohol or medicines that increase serum uric acid level, were excluded.

The subjects who fulfilled the criteria were asked to participatein the study. Informed consent which was approved by the Ethical committee of IPGMER, KOLKATA were taken after through explanation of study protocol. Each participant was interviewed & examined in detail.The B.P of each participant was measured using the auscultatory method with a standard calibrated aneroid type sphygmomanometer with an appropriate sized cuff encircling at least 80% of arm circumference in the seated position with feet on the floor & arm supported at the heart level. Two separate measurements were recorded at 5 min interval & the average of two values was taken as the B.P at that moment. The study subjects were classified into one of the two non-hypertensive B.P categories according to criteria of JNC-7: Pre-hypertension(SBP of 120-139 & or DBP of 80-89 mm Hg.) and normotension(SBP <120 &DBP<80 mm Hg.)

A detailed case record was prepared for each participant on a preformed study sheet. The important factors enquired in the history were--- history of smoking & medications, life-style, family history of CVD, any CVS symptoms. A detailed physical examinations were done, BMIs were calculated as wt. in kg divided by square of height in meter.

In addition to routine investigations like hematological, biochemical profile, some special investigations were done:

1. Fasting lipid profile- Subjects were grouped into those with favorable & those with unfavorable lipid profile based on NCEP-ATP guidelines.

2. Serum uric acid- Subjects were divided into those with hyperuricemia(serum uric acid level>6.8 mg/dl

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for male &>6 mg/dl for female.) and those with normouricaemia.

3. A random urine sample was obtained from each for spot urinary ACR measurement by nephelometric method.To define microalbuminuria in random urine specimen, we used the ACR cut-off values of 30-300 mg/gm of creatinine for both men & women. Subjects with an ACR value of<30 mg/gm were defined as having normoalbuminuria and those with ACR>300 mg/gm were defined as having macroalbuminuria.

4. ECG- to look for evidence of LVH. The SOKOLOW-LYON index was used to diagnose LVH by ECG criteria.

Statistical analysis:

All the data were analysed using SPSS statistical software.

Ethical Issue:- No ethical issue was involved as it is purely an observational study, however the study was conducted after the clearance of the IEC(Institutional Ethics Committee) of IPGME&R,KOLKATA.

Results and analysis

Among the cases, the mean age in the pre-hypertensive subjects (case) was 42.61 years +/- 5.12 years (maximum=52 yrs, minimum= 35yrs) .Majority (64%) belonged to41-50 yrs age group & only 8% belonged to 51-60 age group.

The mean age in the normotensive subjects (control) was 42.28years +/- 2.46years (maximum= 48yrs, minimum= 40 yrs).Also majority(88%) belonged to 41-50 age group. Thus both the groups had a similar age profile and they were age matched.

Among the cases, in the pre-hypertensive subjects, 76% (n=38) were male and 24% (n=12) were female. Among the controls, in the normotensive subjects, 72% (n=36) were male and 28% (n=14) were female. Thus the two groups were sex matched.

Among the cases, in the pre-hypertensive subjects, 58% had normal BMI that was within 18.5 to 22.9kg/met^2& 30% were overweight that was BMI between 23 to 25 kg/m^2& only 12% were obese that is BMI more than 25kg/m^2. Among the controls, in the normotensive subjects ,88% had normal BMI that was within 18.5 to 22.9kg/met^2& 10% were overweight that was BMI between 23 to 25 kg/met^2& only 2% were obese that was BMI more than 25kg/m^2.

In the pre-hypertensive subjects, 56%(n=28) were smoker and 44% (n=22)were nonsmoker.In the normotensive subjects, 54%(n=27) were smoker and 46% (n=23)were nonsmoker.In the pre-hypertensive subjects, 32%(n=16) hadpositive family history of cardiovascular disease like diabetes or hypertension or ischemic heart disease & 68% (n=34)had no cardiovascular disease in the family. In the normotensive control subjects, 32%(n=16) had positive family history of cardiovascular disease like diabetes or hypertension or ischemic heart disease & 68% (n=34)had no cardiovascular disease in the family.

In the pre-hypertensive subjects,60% had systolic B.P in high normal range(130to139mm of Hg.) & 40% had above optimal range that was between 120 to 129 mm of Hg.In the pre-hypertensive subjects, 60% had diastolic B.P in between 80 to 89mm of Hg & 40% had diastolic BP below 80 mm of Hg.

In the pre-hypertensive group,16% (n=8) werehaving impaired fasting glucose that was >100mg% while in normotensive group 8% (n=4)had impaired fasting glucose.

The mean of the FPG in subjects with pre-hypertensive range of B.P was 86.96.12 +/-

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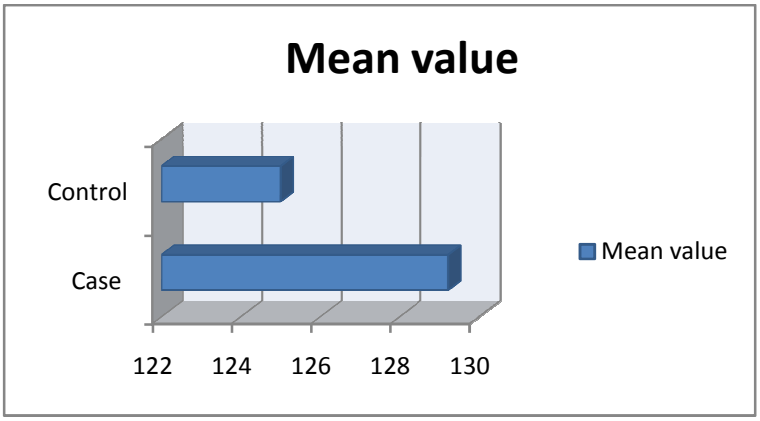
10.03mg/dl (maximum=108mg/dl, minimum=64mg/dl) while in the normotensive subjects the mean value was 81.66 +/- 6.58 (maximum= 104, minimum= 66).

In the Pre-hypertensive group, 10% (n=5) were having increased triglyceride (>150mg%), while in normotensive group, 4% (n=2) were having increased triglyceride.

Triglyceride	Mean value
Case	129.23
Control	125.00

Table-9B

The mean value of the triglyceride in Pre-hypertensive subjects was 129.23.45 +/- 17.21mg/dl (maximum=172mg/dl, minimum=98mg/dl) while that in thenormotensive subjects, it was 127.19 +/- 11.70 (maximum= 147, minimum= 103).

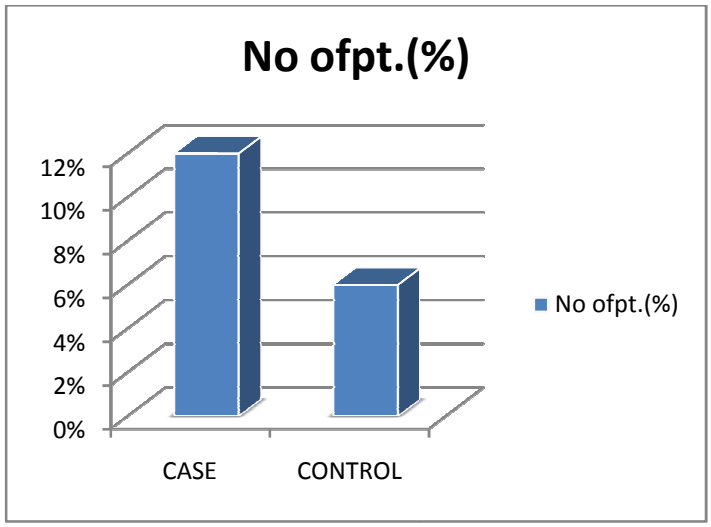


Prevalence of High LDL

High LDL	No of Pt.(%)
Case	6(12%)
Control	3(6%)

Table-10A

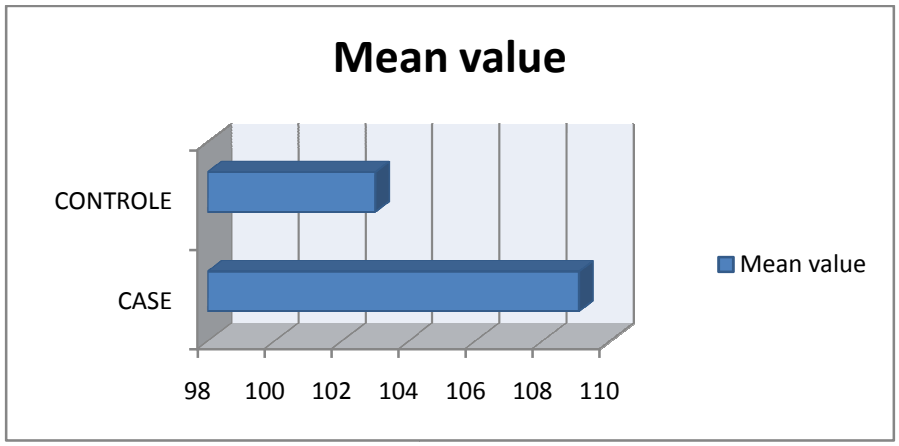
In the Pre-hypertensive group, 12% (n=6) were having increasedLDL level (>130mg %), while in normotensive group, 6% (n=3) were having increased LDL level.



LDL	Mean Value
Case	109.08
Control	102.99

Table-10B

The mean value of LDL in pre-hypertensive subjects was 109.08 ± 17mg/dl (maximum=156mg/dl, minimum=92mg/dl) while that in the normotensive subjects, it was 102.99 +/- 9.12 (maximum= 120, minimum= 90).



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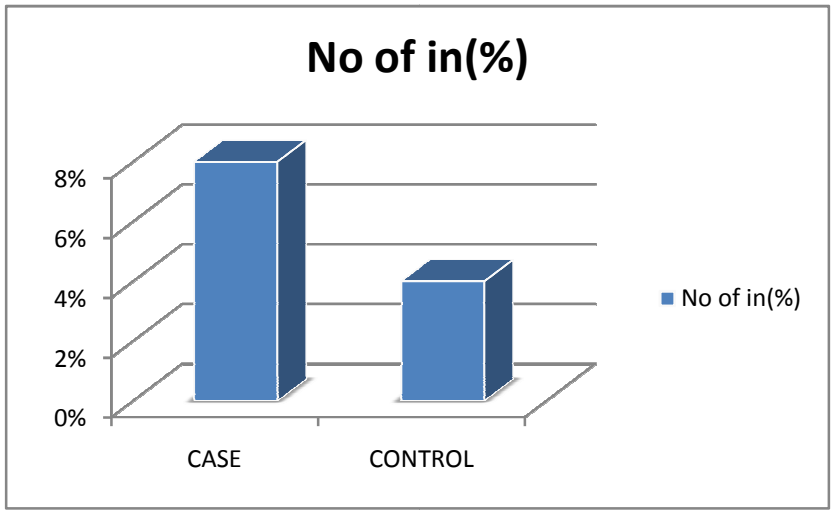
Prevalence of decreased HDL

Low HDL	No of Pt.(%)
Case	4(8%)
Control	2(4%)

Table-11A

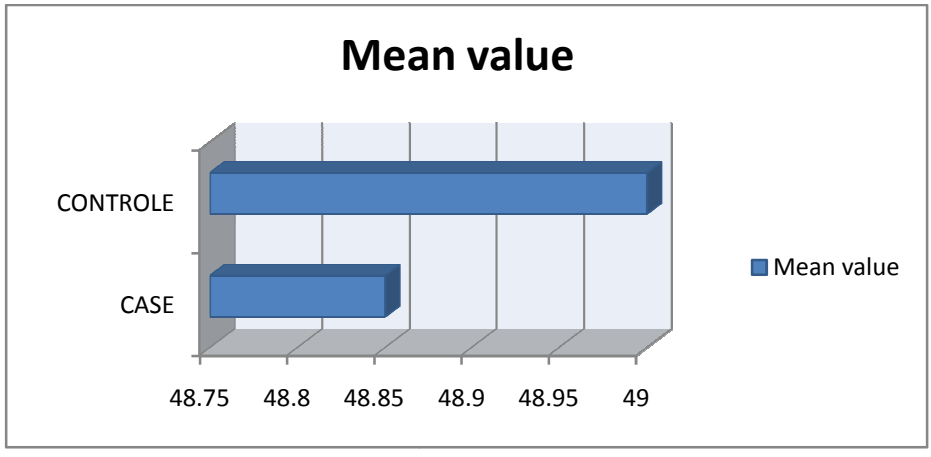
In the Pre-hypertensive group, 8% (n=4) were having decreasedHDL level (For male <40mg %& for female <50 mg%), while innormotensive group, 4% (n=2) were having decreased HDL level.



HDL	Mean Value
Case	48.85
Control	49.00

Table-11B

The mean value of the HDL in pre-hypertensive subjects was 48.85 +/-4.82 mg/dl (maximum=62mg/dl, minimum=41mg/dl) while in the normotensive subjects it was 45.61 +/- 4.15 (maximum= 57, minimum= 40)

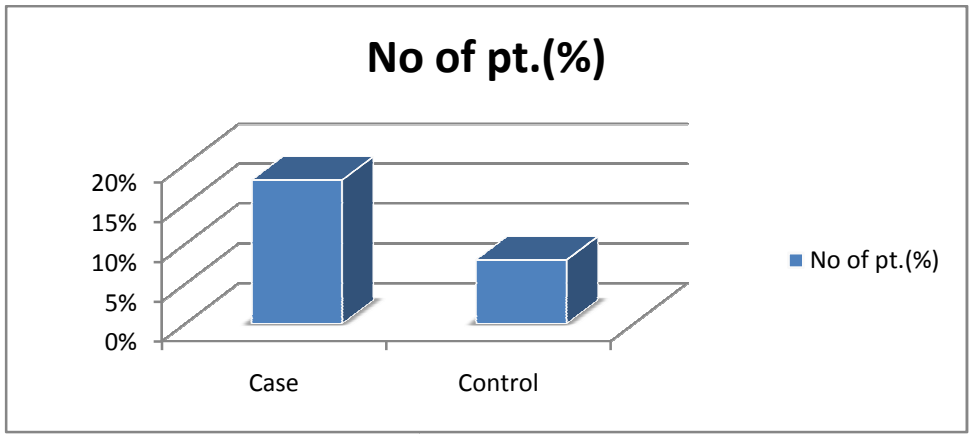


Prevalence of Hyperuricemia

Hyperuricemia	NO of Pt.(%)
Case	9(18%)
control	4(8%)

Table-12A

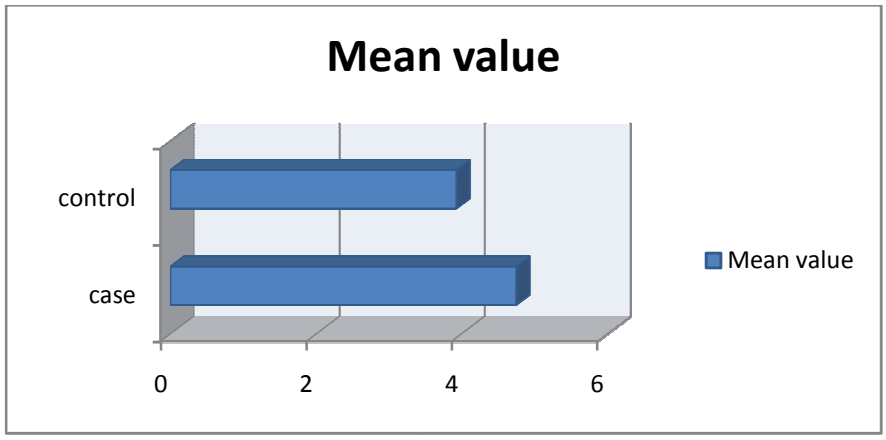
In the Pre-hypertensive group,18% subjects had raised serum uric acid level(For male>6.8mg% & For female>6 mg%) and hyperuricemia was present 8% in normotensive group.



S.uric acid	Mean Value
Case	4.75
Control	3.93

Table-12B

The mean value of the serum uric acid was 4.75mg%(maximum=7.6mg%, minimum=3.2mg%) in pre-hypertensivesubjects,while the value was 3.93 mg%(maximum=7mg%,minimum=3.02mg%) in normotensive subjects.

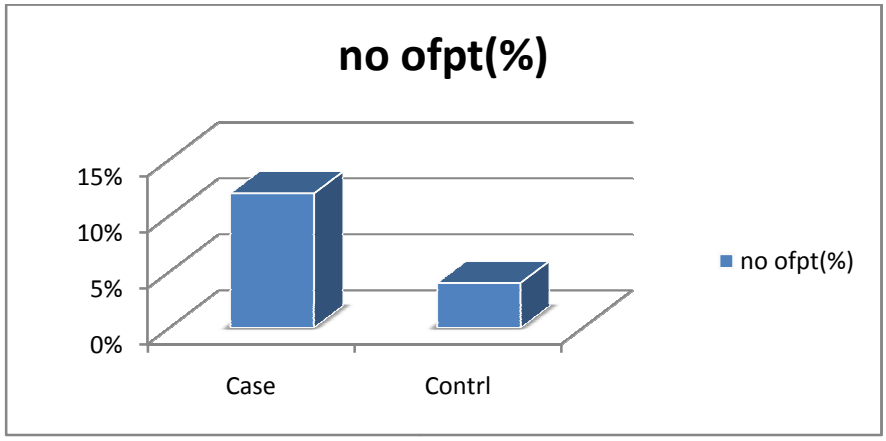


Prevalence of Microalbuminuria

Microalbuminuria	No of Pt.
Case	5(10%)
Control	2(4%)

Table-13A

In the Pre-hypertensive group, spot urinary ACR within microalbuminuric range(30 to300µgm/mg of creatinine) was present in 10% cases while it was present in 4% among normotensives.



Urinary ACR	Mean value
Case	29.23
Control	22.72

Table-13B

The mean value of spot urinary ACR among pre-hypertensives was 29.23 µgm/mg of creatinine(maximum=156 µgm/mg of creatinine, minimum=12.2 µgm/mg of creatinine).Among normotensives mean value was 22.72 µgm/mg of creatinine(maximum=110.3 µgm/mg of creatinine,minimum=11.20 µgm/mg of creatinine).

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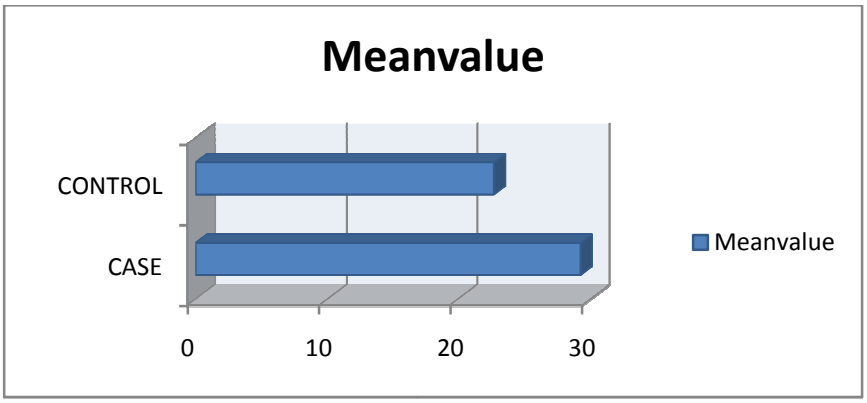
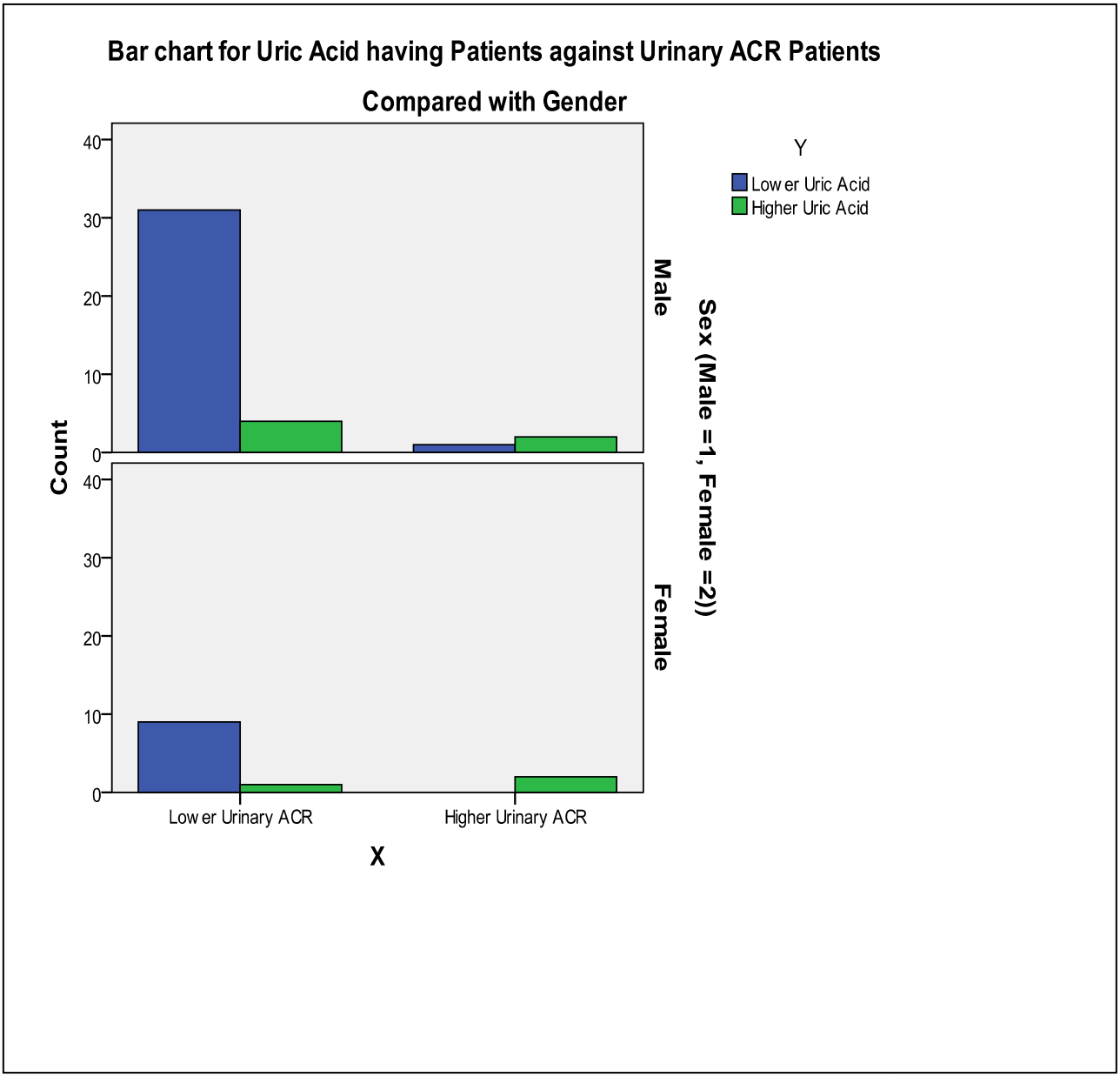

Meanvalue
CONTROL
CASE
0
10
20
30
Meanvalue


Bar chart for Uric Acid having Patients against Urinary ACR Patients
Compared with Gender
Y
Lower Uric Acid
Higher Uric Acid
Count
Male
Female
Sex (Male =1, Female =2))
40
30
20
10
0
Lower Urinary ACR
Higher Urinary ACR
X

Among pre-hypertensive male subjects, with normal urinary ACR, 31cases had normal serum uric acid level, while 4 cases had high serum uric acid.Amongpre-hypertensive female with normal urinary ACR,9 cases had normal s. uric acid while 1 case having high s. uric acid level.

Among pre-hypertensive male subjects, with microalbuminuric range urinary ACR, 1case had normal serum uric acid level, while 2 cases had high serum uric acid.Amongpre-hypertensive female with microalbuminuric range urinary ACR,no case had normal s. uric acid while 2 cases had high s. uric acid level.

	X	Total			
Sex (Male =1, Female =2))	Lower Urinary ACR	Higher Urinary ACR			
Male	Y	Lower Uric Acid	31	1	32
		Higher Uric Acid	4	2	6
	Total	35	3	38	
Female	Y	Lower Uric Acid	9	0	9
		Higher Uric Acid	1	2	3
	Total	10	2	12	
Total	Y	Lower Uric Acid	40	1	41
		Higher Uric Acid	5	4	9
	Total	45	5	50	

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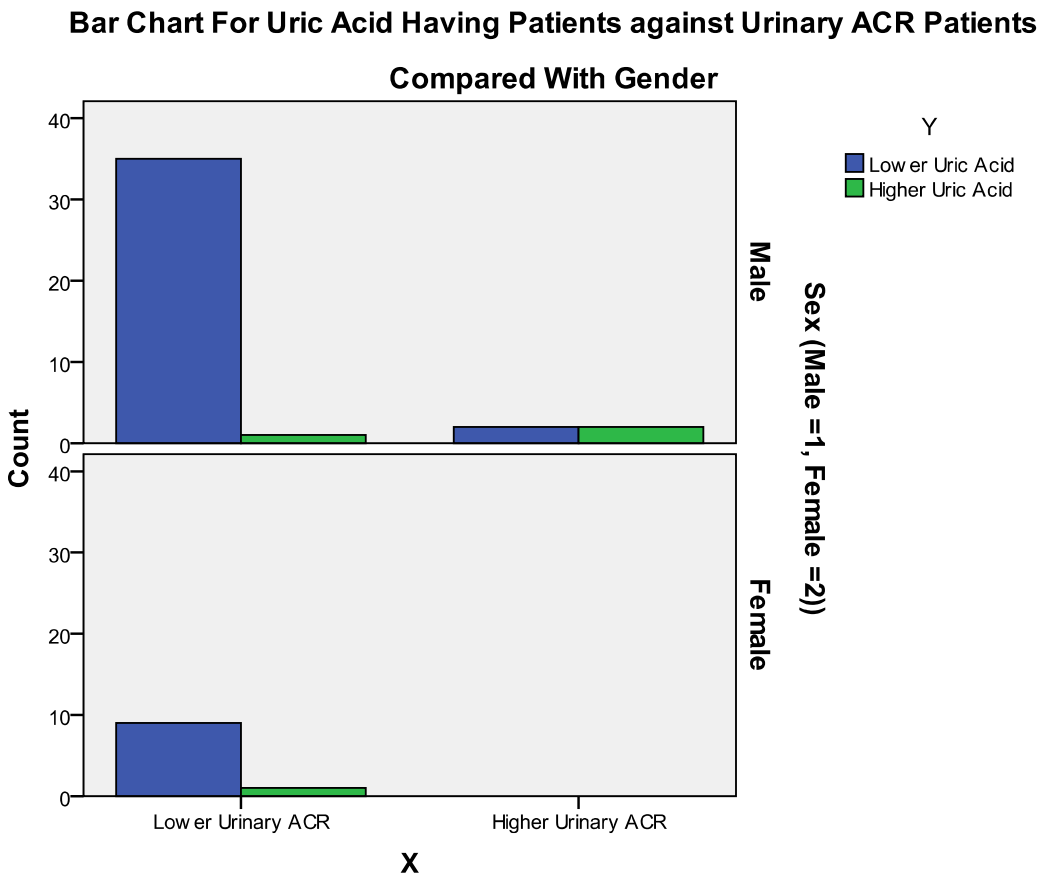
Bar Chart For Uric Acid Having Patients against Urinary ACR Patients
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Higher Uric Acid
Count
Male
Female
Sex (Male =1, Female =2))
40
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Lower Urinary ACR
Higher Urinary ACR
X

Among normtensive male subjects, with normal urinary ACR, 35cases had normal serum uric acid level, while 1 cases had high serum uric acid.Among normotensive female with normal urinary ACR,9 cases had normal s. uric acid while 1 case had high s. uric acid level

Among normotensive male subjects, with microalbuminuric range urinary ACR, no case had normal serum uric acid level, while 2 cases had high serum uric acid.Among normotensive female no cases hadmicroalbumonuric range urinary ACR.

Discussion

Demographic profile:

The mean age in the prehypertensive subjects (case) was 42.61 years +/- 5.12 years (maximum=52 yrs, minimum= 35yrs) .Majority (64%) belonged to 41-50 yr age group & only 8% belonged to 51-60 age group.The mean age in the normotensive subjects (control) was 42.28years +/- 2.46years (maximum= 48 yrs, minimum= 40 yrs).Majority (88%) also belonged to 41-50 age group. Thus both the groups had a similar age profile and they were age matched.

So,41-50 yr. age group subjects will be the best target population for screening for hypertension & by advising life style modifications among them, we might halt the progression from Prehypertensive stage to Hypertensive stage.Only 8% subjects were between 51-60 yr. age group, probably majority of them already progressed to stage of hypertension.

In the prehypertensive subjects, 76%(n=38) were male and 24% (n=12) were female. In the normotensive subjects, 72% (n=36) were male and 28% (n=14) were female. Thus the two groups were sex matched.

The seemingly greater number of males could be explained by the fact that women often neglect their initial symptoms and seek medical advice late due to personal and family pressure. Thus in a hospital-based study, women patients come in lower portion.

In the prehypertensive subjects,58% had normal BMI that was within 18.5 to 22.9kg/met^2& 30% were overweight that was BMI between 23 to 25 kg/met^2& only 12% were obese that is BMI more than 25kg/met^2. In the normotensive subjects ,88% had normal BMI that was within 18.5 to 22.9kg/met^2& 10% were overweight that was BMI between 23 to 25 kg/met^2& only 2% were obese that was BMI more than 25kg/met^2.

So,nearly half(42%) of the prehypertyensive subjects were either overweight or obese while in normotensive only 12% subjects have BMI above normal.

In the prehypertensive subjects, 56%(n=28) were smoker and 44% (n=22)were nonsmoker. In the normotensive subjects, 54%(n=27) were smoker and 46% (n=23)were nonsmoker.So, smoking could not be a confounding factor between case &control.

In the prehypertensive subjects, 32%(n=16) had positive family history of cardiovascular disease like diabetes or hypertension or ischemic heart disease & 68% (n=34)had no cardiovascular disease in the family. In the normotensive subjects, 32%(n=16) had positive family history of cardiovascular disease like diabetes or hypertension or ischemic heart disease & 68% (n=34)had no cardiovascular disease in the family.

So, prehypertensives had significantly higher family history of CVD.

BP distribution among Prehypertensives& association with S. uric acid & Urinary ACR

In the prehypertensive subjects,60% had systolic B.P in high normal range(130to139mm of Hg.) & 40% had above optimal range (120 to 129 mm of Hg). In the prehypertensive subjects, 60% had diastolic B.P

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in between 80 to 89mm of Hg & 40% had diastolic BP below 80 mm of Hg.

Statistical analysis had shown that there was significant association between systolic B.P & S. uric acid level that is high SBP was associated with high S. uric acid level. [Pearson Chi-Square = 3.817, DF = 1, **P-Value = 0.048]**

There was also significant association between Diastolic B.P & Urinary ACR values. [Pearson Chi-Square = 4.733, DF = 1, **P-Value = 0.030]**

Prevalence of metabolic risk factors in Prehypertensives

This study demonstrates prehypertensives had higher prevalence of metabolic risk factors like Dysglycemia in 16% cases,Hypertriglyceridemia 10% cases, high LDL Cholesterol in 12% cases & low HDL cholesterol in 8% case, whereas among normotensives prevalence of Dysglycemia, Hypertryglyceridemia, high LDL-C, low HDL-C were 8%, 4%, 6% & 4% respectively.

Prevalence of Hyperuricemia& microalbuminuria

In the Prehypertensive group,18% subjects had raised serum uric acid level(For male>6.8mg% & For female>6 mg%) and hyperuricemia was present 8% in normotensive group.

The mean value of the serum uric acid was 4.75mg%(maximum=7.6mg%, minimum=3.2mg%) in prehypertensivesubjects,while the value was 3.93 mg%(maximum=7mg%,minimum=3.02mg%) in normotensive subjects.

As, hyperuricemia was present in significant no. of subjects, so, serum uric acid screening will be a necessary part of recommended investigation for all prehypertensive subjects & additional control of serum uric acid level may help to prevent target organ damage.

In the Prehypertensive group, spot urinary ACR within microalbuminuric range(30 to300µgm/mg of creatinine) was present in 10% cases while it was present in 4% among normotensives. The mean value of spot urinary ACR among prehypertensives was 29.23 µgm/mg of creatinine(maximum=156 µgm/mg of creatinine, minimum=12.2 µgm/mg of creatinine).Among normotensives mean value was 22.72 µgm/mg of creatinine(maximum=110.3 µgm/mg of creatinine,minimum=11.20 µgm/mg of creatinine).

Related Studies

RodillaE,Pascal JM et al. studied association between serum uric acid & microalbuminuria in previously untreated essential hypertensive pts.& found that prevalence of hyperuricemia & microalbuminuria were 20.5% & 18% respectively.[84]

Lee JE,Kim YG et al. studied serum uric acid is associated with microalbuminuria in prehypertensives& found microalbuminuria is present in 4% of normotensives & 7.9% of prehyertensives. Prehypertensives with microalbuminuria had higher uric acid level than those of normoalbuminuria.[85]

Jensen J studied microalbuminuria & risk of atherosclerosis & found subjects having urinary albumin creatinine ratio exceeding the upper scale(0.65mg/mol) had a relative risk of 2.3 for developing ischemic heart disease.[87]

Hons L Hillage ,Wilbert MT,Janssen et al. were done a study, showed microalbuminuria was prevalent in 6.6% among non hypertensive,non diabetic subjects & cardiovascular risk factors were already present at levels of microalbuminuria currently considered to be normal.[88]

Kim BJ, Lee HJ, Park J et al. were done a study about comparison of microalbuminuria in two blood

pressure categories of prehypertensive subjects & showed that prevalence of microalbuminuria in the high normal B.P group(SBP=130-139 & or DBP=85-89) was higher than in the normal B.P group(SBP=120-129 & or DBP=80-84).---- 4.9% vs 2.8%. (p=0.009)[90]

P Turton ,JG Fodor, E Helis et al. were done a retrospective analysis of Newfoundland residents that participated in the 1991-1993 community CVD preventive trial. They showed that prevalence of prehypertension was 44% and individuals with prehypertension differ from those with normotension in a number of metabolic risk factors & prevalence of hyperuricemia was 5.6% among Prehypertensives compared to 1.4% among normotensives.[91]

So,the prevalence of hyperuricemia & microalbuminuria in prehypertensives in this study were higher than those reported in previous studies.

Association between Hyperuricemia & Microalbuminuria.

Among prehypertensive male subjects, with normal urinary ACR, 31cases had normal serum uric acid level, while 4 cases had high serum uric acid.Amongprehypertensive female with normal urinary ACR,9 cases had normal s. uric acid while 1 case having high s. uric acid level.

Among prehypertensive male subjects, with microalbuminuric range urinary ACR, 1case had normal serum uric acid level, while 2 cases had high serum uric acid.Amongprehypertensive female with microalbuminuric range urinary ACR,no case had normal s. uric acid while 2 cases had high s. uric acid level.

Logistic regression analysis was done between hyperuricemia & microalbuminuria in Prehypertensive subjects, had shown significant association between them. [P value=0.004]

Linear regression analysis was done and result had shown that they were positively related.(i.e with increase in S.uric acid level, there will be increment of Urinary ACR).

Prevalence of Diastolic dysfunction in Prehypertensives& effect of Hyperuricemia & Microalbuminuria

In the Prehypertensive subjects, Grade-1 Diastolic Dysfunction as evident by E/A ratio <1 on Doppler Echocardiography was present in 20% cases(n=10) & rest of the subjects 80%(n=40) had E/A ratio >1 on Doppler Echocardiography.

Among Prehypertensive subjects having Diastolic dysfunction, 90% cases were either overweight or obese,50% had impaired fasting plasma glucose, 60% had hyperuricemia,50% had microalbuminuric range proteinuria & 50% had both.40% Cases had hypertriglyceridemia&30% cases had low HDL level.So,Prehypertensive subjects with diastolic dysfunction had clusters of metabolic risk factors.

Pearson Chi- Square test had been done between those having diastolic dysfunction and those with normal function and it had been shown that when DD was present, hyperuricemia & microalbuminuria had simultaneously occurred.[Chi- Square value=4.44,df=1,**P value=0.35**] But when diastolic dysfunction was not present, they had no association between them. [Chi- Square value=0.083, df=1, **P value=0.77**]

Increased urinary albumin excretion is associated with signs of subclinical organ damage, such as left ventricular hypertrophy, and increased carotid wall thickness[57]. In light of these observations, microalbuminuria was found to be an excellent predictor of cardiovascular morbidity and mortality in hypertensive patients in several prospective studies.[59]

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After being exposed to risk factors for variable periods of time, some patients suddenly develop acute events. However, a large number of these patients first progresses through an asymptomatic phase that is characterized by the presence of subclinical organ damage: left ventricular hypertrophy, peripheral atherosclerosis, and mild renal dysfunction[60]. This asymptomatic phase often precedes and predicts the occurrence of major events. Nowadays, we can easily identify patients who are at this preclinical stage and with appropriate aggressive multifactorial treatment, not only can prevent the occurrence of major events but also can obtain regression of organ damage. Within this context, microalbuminuria, an integrated marker of target organ damage and, therefore, of global risk, could prove to be a valuable tool in the screening and identification of hypertensive patients who are at higher cardiovascular risk. Its low cost and widespread availability makes it more acceptable.. It is interesting that recent data from the Losartan Intervention For Endpoint study indicate that the relationship between urinary albumin excretion and cardiovascular risk holds true, well below the levels currently used to define microalbuminuria [61]. Furthermore, there is evidence that the regression of left ventricular hypertrophy parallels the reduction of albuminuria and is related to it, to some degree regardless of BP changes[62]. This opens the way to a broader use of microalbuminuria assessment not only for its prognostic value but also for monitoring the efficacy of treatment.

This study demonstrated the relationship between s.uric acid level & MA in prehypertensivepersons. The findings suggested that s. uric acid level can be a strong predictor of CVD when combined with elevated B.P(even mildly elevated).Endothelial dysfunction may be a possible pathway linking uric acid &CVD[85].Although several studies have previously shown the association between hyperuricemia & MA in hypertensive patients[86], it's relationship in subjects without hypertension is unknown.To our knowledge, the present study is the first research to demonstrate that s. uric acid level is associated with an increased risks for MA in subjects with prehypertension.

It is unknown whether increased uric acid level & high B.P have synergistic effects on miocroalbuminuria or whether uric acid level is another marker of target organ damage by high B.P.Increased uric acid level in the pre-hypertensive group may have a pathological role in target organ damage.Several mechanisms have been proposed to explain a possible causal relationship.It has been shown previously that hyperuricemia induced endothelial dysfunction,glomerular hypertension & renal hypertrophy,even in conditions of mild hypertension in experimental rat models.

Several studies have demonstrated that subjects with prehypertension are at increased CVD such as impaired ventricular relaxation, MA.[89]However there is yet no data to prove that pharmacological therapy in prehypertension improves outcome.

Our observational data imply that pre-hypertensive subjects with hyperuricemia & microalbuminuria may also be a high risk group that could benefit from lowering B.P.

Conclusion:

This study showed that microalbuminuria was associated with a greater probability of hyperurecaemia in both male and female patients with prehypertension. Majority of prehypertensive subjects were between 41-50years age group, So they are the best target population for screening of

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hypertension. Nearly half of the prehypertesives were either overweight or obese.

So life –style modifications may prevent the progression of CVD. Prehypertensives had higher prevalence of metabolic risk factors like dysglycemia, dyslipidemia. Hyperuricemia and microalbuminuria were more prevalent among prehypertensives.

There was statistically significant association .between hyperuricemia & microalbuminuria in Prehypertensives. Prehypertensives had significant percentages of Grade-I diastolic dysfunction on Doppler echocardiography.

Among Prehypertensives,those having Diastolic dysfunction , half of the cases had both Hyperuricemia and microalbuminuria.

This study demonstrated hyperuricemia and microalbumiuria were integrated markers of CVD risks& subclinical target organ damage. So, uricacid and microalbuminuria screening will be a necessarypart of recommended investigations in all prehypertensives for early risk profiling and may lead to new therapeutic strategies in prevention of CVD. This study forms a background of a future prospective study.

Bibliography

1. Messarli FH, et.al. Essential hypertension. Lancet 2007;370:591-603.
2. CarellaMJ,et al Early diabetic nephropathy.Emarging treatment options.Arch Intern Med 1994;154:625-630.
3. KaralliedeJ,et al Microalbuminuria and cardiovascular risk .Am J Hypertens 2004;17;986-93
4. World Health Organization, The World Health Report :Reducingrisks,Promoting Healthy Life,2002.http://www.who.int/whr 2002
5. Shaw DI,et al Metabolic syndrome What is it and what are the implications?ProcNutr. Soc 2005;64:349-57
6. Jensern JS et al.Arterialhypertension,microalbuminuria,and risk of ischemic heart disease.Hypertension.2000;93:898-903
7. Gerstein H C et al Albuminuria and cardiovascular events,death and heart failure in diabetic and non diabetic individuals JAMA 2001;286:421-6
8. Klausen k et al very low levels of microalbuminuria are associated with increased risk of coronary heart disease and death independently of renal function hypertension, and diabetes circulation 2004;96:247-57
9. Lewington S et al.Prospective Studies Colaboration:Age specific relevance of usual blood pressure to vascular mortality:A meta-analysis of individual data for million adults in 61 prospective studiesLancet.360:1903-1913.2002.
10. Das SK,Basu A .Study of urban community survey in India:growing trend of high prevalence of hypertension in a developing country.Int J Med Sci 2005;270-8
11. Companini B. The World Health Report.Reducing Risks Promoting Healthy life.Geneva World Health Organization, 2002.
12. Wolf-Maier K. Cooper Rs. et al. Hypertension treatment and control in five European countries. Canada and the United States. Hypertension 43:10, 2004.

13. Kaplan NM, Opie LH: Controversies in hypertension. Lancet 367: 168, 2006.
14. Giles TD, Berk BC Et Al: Expanding the definition and classification of Hypertension. J Clin Hypertension (Greenwich) 7:505, 2005.
15. Vasan RS, Beiser A. et al. Residual lifetime risk for developing Hypertension in middle-aged woman and men. The Framingham Heart Study.JAMA 287:1003, 2002.
16. Chobanian AV, BaknisGl, Black HR et al. Seventh report of the joint National Committee on Prevention Detection, Evaluation and Treatment of High Blood Pressure. Hypertension 42:1206-1252, 2003.
17. Chobanian AV, BaknisGl, Black HR et al. Seventh report of the joint National Committee on Prevention Detection, Evaluation and Treatment of High Blood Pressure. The JNCT Repot.JAMA. 289:2560-2572,2003.
18. Burl VL, Whelton P. Roceella EJ, et al. Prevalence of Hypertension in the US. Population Results form the third National Health and Nutrition Examination Survey, 1968-1991, Hypertension 25:305-314,1995.
19. Barondess J: The future of generalism Ann Intern Med 119:153-260,1993.
20. Hajjar J, Kotehen TA: Trends in prevalence, awareness, treatment and control of hypertension in United States, 1988-2000, JAMA 290:199-206. 2003.
21. Riva-Rocci S. Un Nuovo sphygmomanometer, Gaz Med Tomino 47:981, 1896.
22. Korotkov NA. Contribution to the problem of methods for the determination of the blood pressure, IzvImperatorskoiVoemoMeditsiskoy Akas 11:365,1905.
23. Port S, Dewer L, Jennrich R et al: Systolic blood pressure and mortality. Lancet 355:175-180, 2000.
24. Alderman M: Measures and meaning of blood pressure. Lancet. 355:159,2000.
25. Franklin SS. Khan SA. Wong ND et al: Is pulse pressure useful in predicting risk for coronary heart disease? The Framingham Heart Study, Circulation 100:354-360.1999.
26. Domanski M. Mitchell G. Pfeffer et al: Pulse pressure and cardiovascular disease related. Mortality; Follow up study of the Multiple Risk Factor Intervention Trial (MRFIT) JAMA. 287:2677-2683, 2002.
27. Franklin SS: Blood pressure and cardiovascular disease: What remains to be achieved? J. Hypertens 19:S3-S8, 2000.
28. Franklin SS, Larson MG, Khan SA et al. Does the relation of blood pressure to coronary heart disease risk change with aging? The Framingham Heart Study. Circulation 103:1245-1249, 2001.