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Coronary Artery Disease Pattern using Gensini Score in Urban and Rural Indian Population

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Abstract

Introduction:
Gensini scoring system is an objective method to determine the severity of Coronary Artery Disease (CAD) based on angiographic findings. We are conducting this study as sparse data is available about association between the severity of CAD in Urban & Rural population.

Objective:
To study the CAD pattern by angiogram using Gensini score in urban and rural Indian population.

Material and methods:
A cross-sectional study of all patients with CAD coming to Sri.Jayadeva Institute of Cardiovascular Sciences and Research, Mysore from urban and rural areas presenting with known or suspected CAD with chest pain suggestive of CAD and various investigations suggestive of CAD were screened. Patients with evidence of CAD on coronary angiogram were included in the study.

Results:
Total 500 subjects who had evidence of CAD on Coronary angiogram were included in the study. Among them, number of subjects from Urban is 250 and Rural is 250. Out of 250 subjects in urban 73.6% (184) were male and 26.4% (66) were female subjects. Of the 250 subjects in rural 76% (190) were male and 24% (60) were female. Mean Gensini score in urban population is 40.69 and rural population is 22.85 which was significantly more in urban than rural population ($p<0.0001$). Number of diseased vessels in Urban is 1.808 and rural is 1.456 which was significantly more in urban than rural population ($p<0.0001$).Gensini Score was compared with each risk factors between urban and rural subjects and it is significantly more in urban population in 40-70 years age group, among males, across all risk factors, BMI >25, sedentary life style, DM, HTN, Dyslipidemia, F/H/O CAD, Smoking compared to rural population. The Genisini score is high in urban than rural subjects and indicating severity of coronary artery disease is more in urban population compared to rural population.

Conclusions:
Gensini score is more in urban population compared to rural population indicating more coronary lesions in urban population. Gensini Score was compared with each risk factors between urban and rural subjects and it is significantly more in Urban than Rural population.

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KEY WORDS:
Coronary Artery Disease(CAD), Gensini score, Urban, Rural

Introduction:
Cardiovascular disease is the leading cause of death worldwide, accounting for 17.7 million deaths annually; of them, 6.2 million (35%) occur in middle age (30–69 years)[1]. India accounts for more than one-fifth of these deaths, according to WHO study, and therefore reduction of global cardiovascular mortality greatly depends on India, where cardiovascular disease develops a decade earlier in life than in high-income countries[2].
According to a population-based cross-sectional survey, the prevalence of coronary artery disease (CAD) in India was estimated to be 3%–4% in rural areas and 8%–10% in urban areas, with a total of 29.8 million affected[3].
The Gensini scoring system is an objective method to determine the severity of CAD according to angiographic findings[4.] However, little is known about the association between the severity of CAD assessed by the Gensini score in urban and rural patients with CAD.

Objective:
To study the CAD pattern by angiogram using Gensini score in urban and rural Indian population.

Material and methods:
A cross-sectional study of all patients with CAD coming to Sri.Jayadeva Institute of Cardiovascular Sciences and Research, Mysore from urban and rural areas presenting with known or suspected CAD with chest pain suggestive of CAD and various investigations suggestive of CAD were screened. Patients with evidence of CAD on coronary angiogram were included in the study. Risk factors of each patient was recorded. Number of vessel disease and Gensini score was calculated for each lesion. The Gensini score calculated for each patient from the coronary arteriogram. It is computed by assigning a severity score to each coronary stenosis according to the degree of luminal narrowing and its geographic importance. Reduction in the lumen diameter and the roentgenographic appearance of concentric lesions and eccentric plaques evaluated and complete occlusion assigned. Each principal vascular segment assigned a multiplier in accordance with the functional significance of the myocardial area supplied by that segment.
Urban and Rural areas[5]: Urban and rural areas were defined according to Census of India definitions
Number of vessels diseased[6]: The number of diseased vessels is measured according to coronary artery surgery study (CASS) criteria.
Gensini Score[4, 7]: This index assigns a heavier weight to the more severe luminal narrowings. Weights are also assigned to each segment depending on vessel size and importance; segments serving larger regions of myocardium are more heavily weighted. For each segment the two weights are multiplied. The sum of the products is the Gensini score. The Gensini score is calculated for each patient from the coronary arteriogram. The Gensini score is computed by assigning a severity score to each coronary stenosis according to the degree of luminal narrowing and its geographic importance. Reduction in the lumen diameter, and the roentgenographic appearance of concentric lesions and eccentric plaques were evaluated (reductions of 25%, 50%, 75%, 90%, 99%, and complete occlusion were given Gensini scores of 1, 2, 4, 8, 16, and 32, respectively). Each principal vascular segment is assigned a multiplier in accordance with the functional significance of the myocardial area supplied by that segment: the left main coronary artery, x 5; the proximal segment of left anterior descending coronary artery (LAD), x 2.5;the proximal segment of the circumflex artery, x 2.5; the mid segment of the LAD, x 1.5; the right coronary artery, the distal segment of the LAD, the posterolateral artery, and the obtuse marginal artery, x 1; and others, x 0.5.

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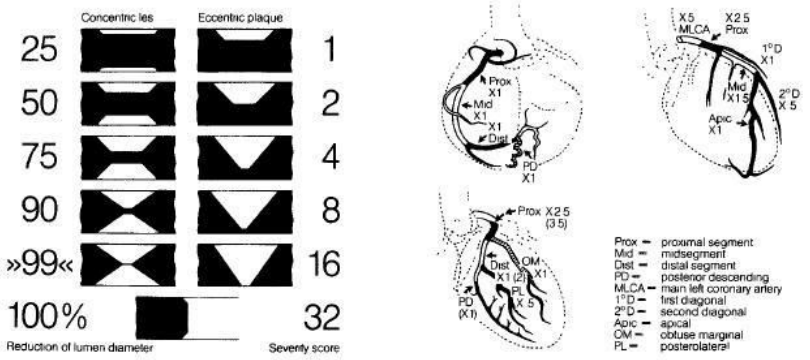

Inclusion criteria:

1. Patients with Coronary angiogram confirmative of CAD were included.

Exclusion criteria:

1. Patients with Coronary angiogram not confirmative of CAD were excluded.

Ethics Committee:

Ethics committee approval was taken from Sri.Jayadeva Institute of Cardiovascular Sciences and Research, Mysore.

Statistical Analysis:

The data were entered in Microsoft Excel sheet and appropriate tests like chi-square, 't'-test and ANOVA were applied. In all the above test P value less than 0.05 were taken to be statistically significant. The data was analyzed using SPSS package.

Results:

Total 500 subjects who had evidence of CAD on Coronary angiogram were included in the study. Among them, number of subjects from Urban is 250 and Rural is 250. Out of 250 subjects in urban 73.6% (184) were male and 26.4% (66) were female subjects. Of the 250 subjects in rural 76% (190) were male and 24%(60) were female. Mean Gensini score in urban population is 40.69 and rural population is 22.85 which was significantly more in urban than rural population ($p<0.0001$).

Number of diseased vessels in Urban is 1.808 and rural is 1.456which was significantly more in urban than rural population ($p<0.0001$).There was no significant difference in gensini score between urban and rural population in '0'vessel disease or mild CAD, whereas in single, double and triple vessel disease patients Gensini score was significantly more in urban compared to rural population

Table:1 Coronary angiogram and Gensiniscore pattern

		Urban(n=250)	Rural(n=250)	P Value
No. of Diseased Vessels		1.808	1.456	**<0.0001**
Gensini Score		40.69	22.85	**<0.0001**
No. of Diseased Vessels & GensiniScore	0 (n=46)	23 (n-15)	74.5 (n-31)	**0.1848**
	1(n=213)	2845(n-94)	2149 (n-119)	**<0.0001**
	2(n=120)	2654 (n-65)	1600 (n-55)	**0.0091**
	3(n=121)	4651 (n-76)	1889 (n-45)	**0.0041**

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Table 2: Risk factors and Gensini score

		Urban (n=250)	Rural (n=250)	P value
Age	≤40yrs	1017 (n-39)	682 (n-43)	**0.0843**
	41-55	4354.5 (n-114)	1930 (n-89)	**<0.0001**
	56-70	4203.5 (n-84)	2620 (n-99)	**<0.0001**
	>70	598 (n-13)	481 (n-19)	**0.1168**
Sex	Male	8000 (n-184)	4075.5 (n-190)	**<0.0001**
	Female	2173.5 (n-66)	1637.5 (n-60)	**0.273**
	P Value	**0.0278**	**0.0672**	
BMI	<25	7078 (n-175)	4139.5 (n-188)	**<0.0001**
	≥25	3095.5 (n-75)	1573.5 (n-62)	**0.0006**
	P Value	**0.7154**	**0.3516**	
DM	Yes	4476.5 (n-101)	1871 (n-72)	**<0.0001**
	No	5697 (n-149)	3842 (n-178)	**<0.0001**
	P Value	**0.1447**	**0.1441**	
HTN	Yes	4073.5 (n-100)	1674.5 (n-70)	**<0.0001**
	No	6090 (n-150)	4038 (n-180)	**<0.0001**
	P Value	**0.8711**	**0.6257**	
Smoking	Yes	2188.5 (n-65)	1532.5 (n-78)	**0.0010**
	No	7962 (n-185)	4180.5 (n-172)	**<0.0001**
	P Value	**0.0597**	**0.1137**	
F/H/O CAD	Yes	2441.5 (n-75)	1283.5 (n-74)	**0.0014**
	No	7722 (n-175)	4421.5 (n-176)	**<0.0001**
	P Value	**0.0133**	**0.0085**	
Dyslipidemia	Yes	7135 (n-146)	3443.5 (n-123)	**<0.0001**
	No	3028.5 (n-104)	2269.5 (n-127)	**0.0037**
	P Value	**<0.0001**	**0.0002**	
Physical Inactivity	Yes	3288.5 (n-93)	1163 (n-52)	**0.0135**
	No	6875 (n-157)	4550 (n198)	**<0.0001**
	P Value	**0.0541**	**0.8553**	

Gensini score in patients aged ≤40yrs in Urban population is 1017 and rural is 682 with no significant difference between the groups. Patients aged between 41-55 years, the Gensini score is 4354.5 in Urban and 1930 in rural population with significant difference between the groups. Patients aged between 56-70 years, the Gensini score is 4203.5 in Urban and 2620 in rural population with significant difference between the groups. In patients aged >70 years in Urban population is 598 and rural is 481 with no significant difference between the groups.

Gensini score in male patients in urban is 8000 and in rural is 4075.5 with significant difference between the groups. In female patients in urban is 2173.5 and in rural is 1637.5 with no significant difference between the groups. When compared between male and female, there is significant difference in urban population and not significant difference in rural population.

Gensini score compared between the groups with BMI <25 and ≥25 and Gensini score was significantly more in urban compared to rural population.

In patients with Diabetes and without Diabetes in both groups Gensini score was significantly more in urban than rural population.

When the Gensini score was compared between the groups with hypertension and without hypertension, there Gensini score was significant more in urban than rural population in both groups.

In patients with history of smoking and without smoking, Gensini score was significantly more in urban than rural population in both groups.

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Gensini score compared between the groups with Family history of CAD and without Family history of CAD and in both groups urban population has significantly more Gensini score than rural population.
When the Gensini score was compared between the groups with dyslipidemia and without dyslipidemia, the score was significantly more in urban than ruralpopulation in both the groups.
When Gensini score was compared between the groups with physical Inactivity and without physical Inactivity the score was significantly more in urban then rural population in both the groups.

Discussion:

Coronary angiography is useful for diagnosing coronary atherosclerosis in patients with ischemic heart disease. We have used Gensini score and number of vessel diseased to assess the severity of CAD because it reflects both the degree and position of stenosis.
In our study Mean Gensini score in urban is significantly higher than rural population, the . Number of diseased vessels in Urban is also significantly greater than rural population and as the number of diseased vessels increased the gensini score also increased. In single, double and triple vessel disease, gensini score is significantly higher in urban than rural population. The Gensini score is high in urban than rural subjects and indicating coronary lesions are more in urban population compared to rural population.
In a study by Rajith K S etal[8], The mean Gensini score was significantly higher in the city population than in the rural population. As the number of diseased vessels increased, the Gensini score increased in the city, urban and rural populations. In patients with three-vessel disease, the mean Gensini score was significantly higher in the city and urban populations than in the rural population.
In patients with ≤ 40 years and >70 years Gensini score was not significantly differentin urban and rural population.There was significantly higher Gensini score was seen in urban population in the age group of 41-70years than rural population.
In a study by Rajith K S etal[8], In patients aged ≤40 years, 41–55 years and > 70 years, the Gensini scores were the same in city, urban and rural populations, whereas in patients aged 56–70 years, the Gensini score was higher in the city population.
When compared between male and female sex, In Male sex Gensini score was significantly higher in urban population compared to rural, wheras in Female population there was no significant difference in Gensini score in urban and rural population.
Gensini Score was compared with each risk factors between urban and rural subjects and it is significantly more in urban population across all risk factors, BMI >25,sedentary life style, DM, HTN, Dyslipidemia, F/H/O CAD, Smoking compared to rural population. The Genisini score is high in urban than rural subjects and indicating severity of coronary artery disease is more in urban population compared to rural population.
In a study by Rajith K S etal[8], The Gensini score was higher in the city population among men; smokers and patients with hypertension, a family history of ischemic heart disease, a sedentary lifestyle, BMI ≥ 25 kg/m and HDL cholesterol levels
KasaokaSet al[9]have showed that the Gensini score is significantly higher in the hypercholesterolemia group than in normal cholesterol, diabetes mellitus and hypertension group. These results suggest that hypercholesterolemia has a greater influence on the severity of coronary artery lesions than does hypertension or diabetes mellitus and that the progression of coronary atherosclerosis may differ among patients with these risk factors.
Horimotoet al[10] stated that the independent predictors of the severity of CAD were age, diabetes mellitus, hypertension, smoking and male sex.
The present study showed that Gensini score is significantly higher in the urban than rural populations. These variations may be explained partly by differences in lifestyle. Men and women in rural areas work in agriculture, which involves heavy physical activity, while men and women residing in urban areas have sedentary habits.
Recent studies have concluded that the rates of CAD, hypertension, diabetes, dyslipidemia and obesity are low among the rural population of India, and high in urban population. The lifestyle in the rural is still traditional, vegetarian diet and not much fried food is consumed. Further, agricultural work demands strenuous physical activity and leaving little room for obesity. All these factors contribute to more severe disease in urban population compared to rural population and which can be reduced with life style modification[4].

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Genisini score is more in urban population with risk factors and without risk factors as well and traditional way of life is advisable in order to prevent severity of CAD. This present study showed that Gensini score is significantly more in urban population compared to rural population. These variations may be explained partly by differences in lifestyle. Rural men and women work in agriculture, involving heavy physical activity, while most urban men and women have sedentary habits. Lack of physical activity and consumption of more food resulted in more severe of CAD in Urban population.

Conclusions

Gensini score is more in urban population compared to rural population indicating more severe coronary artery disease in urban population. Gensini Score was more in urban population in the age group of 41-70 years, Male sex, BMI<25 & BMI ≥ 25, with DM and without DM, with dyslipidemia and without Dyslipidemia, with smoking and without smoking, with family history of CAD and without Family History Of CAD and in those with physical inactivity and without physical inactivity compared to rural population which indicates that the traditional way of life is advisable in order to prevent CAD. Gensini score which reflects both the degree and the position of stenosis is a good tool to assess coronary artery lesions. Suggestive of More severe disease in urban population compared to rural population and which can be reduced with life style modification.

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