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THE COMPARISON OF CORONARY ANGIOGRAPHIC PROFILE BETWEEN DIABETIC AND NON-DIABETIC PATIENTS WITH CORONARY ARTERY DISEASE IN A NEPALESE POPULATION

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Abstract

Background: Diabetes mellitus is associated with an increase in cardiovascular morbidity and mortality. As the prevalence of diabetes mellitus is increasing globally the burden of death related to cardiovascular disease including myocardial infarction will be a great burden to countries like Nepal. The aim is to compare the extent and severity of coronary artery disease between diabetic and non-diabetic patients referred for coronary angiography.**Materials and methods:**It was a Hospital-based, cross-sectional study conducted in the Department of Internal medicine, BPKIHS Dharan, Nepal. All consecutive patients undergoing coronary angiography with a clinical indication for the procedure during the study period of one year were included in the study. 61 subjects with diabetes were compared with 147 subjects without diabetes for assessing the severity and extent of coronary artery disease. The coronary atherosclerosis score was used to grade the severity of lesions visualized by coronary angiography.**Results:**The mean coronary atherosclerosis score was 6.64±4.18 among diabetes and 4.97±4.07 among the non-diabetic group with p-value of 0.008 which was statistically significant. The left anterior descending coronary artery was significantly more frequently involved in diabetics than nondiabetic patients 88.52% vs. 66.67% (p<0.002).**Conclusion:**Diabetic patients had more severe and extensive atherosclerotic lesions in coronary arteries than the non-diabetic patients on coronary angiography suggesting atherosclerotic burden in the diabetes population is higher in our population.

Key Words: Diabetes, coronary angiography, coronary atherosclerosis score

Introduction

According to the International Diabetes Federation diabetes affects at least 285 million people worldwide, and that number is expected to reach 438 million by the year 2030, with two-thirds of all diabetes cases occurring in low- to middle-income countries.[1] Because of this recognized high risk of cardiovascular events in patients with diabetes mellitus, the American heart association recommends that they belong to the same high-risk category as patients with known coronary artery disease. Therefore, diabetes mellitus is considered a CAD risk equivalent.[2] The negative prognostic role of diabetes in coronary artery disease is well known and is related to the greater atherosclerotic burden, metabolic derangement, and pro-inflammatory and pro-thrombotic state associated with diabetes[3]. The observed poorer clinical outcomes among diabetic patients with CAD are likely due to multiple factors—coexistent renal disease, hypertension, peripheral vascular disease, and the aggressive nature of the CAD itself.[4] Various autopsy studies have reported that diabetic patients had a larger extent of raised atherosclerotic lesions, greater incidence of left main coronary artery stenosis, and more extensive and diffuse disease compared with non-diabetic patients. Distal coronary involvement is also more frequent in diabetics than non-diabetics.[5] The purpose of coronary angiography is to define coronary anatomy and identify luminal narrowings In addition, angiography is

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the only diagnostic modality capable of providing information about the longitudinal distribution of atherosclerosis and the likelihood of success with percutaneous coronary interventions (PCI) or surgical revascularization; this is particularly important in patient with diabetes mellitus.[6]

The aim of this study was to compare the extent and severity of coronary artery disease between diabetic and non-diabetic patients referred for coronary angiography.

Material and Methods

It was a Hospital-based, cross-sectional study done over a period of one year from 15th February 2012 to 14th February 2013. All consecutive patients undergoing coronary angiography with clinical indication for the procedure in the Department of Internal medicine during the study period of one year were included in the study. 61 subjects with diabetes were compared with 147 subjects without diabetes for assessing the severity and extent of coronary artery disease. Non-diabetic CAD patients also referred for coronary angiography, were compared with diabetic patients for sex, age, and body mass index.

The patients were not exposed to any risk factors beyond those normally encountered during routine clinical care of patients with coronary artery disease undergoing coronary angiography. The study protocol was approved by the institutional ethical review board (IERB).

Detailed socio-demographic data for every patient was collected and recorded in structured Performa. The demography will include age, sex, Hypertension, Smoking, Alcohol consumption, obesity, history of ischemic heart disease, family history of DM, and family history of CAD.

Patients were classified as diabetics if they fulfilled the criteria given by the American diabetic association, in 2011 or were receiving anti-diabetic treatment. Diabetes duration was estimated from the patient's previous laboratory reports as well as from interviewing the patient or his/her family members.

The clinical parameters noted were Fasting plasma glucose (mg/dl), 2h plasma glucose (mg/dl), Triglyceride (mmol/L), Total cholesterol (mmol/L), HDL cholesterol (mmol/L), LDL cholesterol (mmol/L).

Coronary angiography was performed by the percutaneous femoral approach using standard angiographic techniques. Several views of the left and right coronary arteries, including craniocaudal angulations were recorded on film. Each coronary segment was coded according to cardiobase coronary artery code. The coronary angiograms were analyzed using third-generation QCA software, Cardiovascular Measurement System (QCA-CMS) version 3.0. Any degree of luminal narrowing due to atherosclerosis was taken as vessel involvement. The severity of coronary atherosclerosis was estimated by calculating the coronary atherosclerosis score (CAS), which is based on the number of stenotic coronary artery segments, and the degree of their lumen stenosis. The extent and severity of the CAD were assessed by assigning points to each lesion as follows:

Luminal diameter involvement	score
> 50% stenosis	1
50-74% stenosis	2
75-99% stenosis	3
Total obstruction	4

The points for each lesion in coronary arteries including proximal, medial, and distal segments were summed and a cumulative CAS was obtained. The severity of the CAD was further classified as one, two, or three-vessel disease according to the number of stenotic coronary arteries in the three major vessels. Significant CAD was defined as more than 50% stenosis in at least one coronary artery segment.

The clinical care and treatment decisions were ordered by the treating physician and treatment was based on the standard treatment practice of coronary artery disease in our hospital.

For descriptive statistics Mean, Standard Deviation,

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Percentage proportion, etc., were calculated, and tabular and graphical presentations were prepared. For inferential statistics, the chi-square test and mean comparison test was carried out at a 95% confidence interval where p=0.05.SPSS version 17 was used for statistical analysis.

RESULTS

A total of 208 patients who underwent coronary angiography from 15th February-2012 to February 14th -2013 admitted to the department of Internal Medicine with the clinical diagnosis of stable Angina and Acute coronary syndrome were included in the study.

61 subjects with diabetes were compared with 147 subjects without diabetes for assessing the severity and extent of coronary artery disease.

Table 1: Baseline characteristics between diabetics and non-diabetics.

CHARACTER		DIABETICS	NON-DIABETICS	P-VALUE
AGE(MEAN)		59.51	59.52	0.910
SEX	FEMALE	23(37.7%)	41(27.9%)	0.163
	MALE	38(62.2%)	106(72.10%)	
DIAGNOSIS	ACS-STEMI	43(70.5%)	106(72.10%)	0.805
	ACS-NSTEMI	9(14.75%)	24(16.32%)	
	CSA	9(14.75%)	17(11.56%)	
FAMILY HISTORY OF DIABETES MELLITUS		7(11.4%)	2(1.36%)	0.003
FAMILY HISTORY OF CORONARY ARTERY DISEASE		5(8.19%)	4(2.72%)	0.086
HYPERTENSION		48(78.68%)	88(59.86%)	0.006
DYSLIPIDEMIA		25(40.98%)	28(19.04%)	0.001
SMOKING		10(16.39%)	67(45.57%)	<0.001
SEDENTARY LIFESTYLE		22(36.06%)	48(32.68%)	0.653

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ALCOHOL	3(4.9%)	15(10.20%)	0.217
ISCHEMIC HEART DISEASE IN PAST	2(3.27%)	10(6.8%)	0.321
OBESITY	12(19.6%)	21(14.28%)	0.333

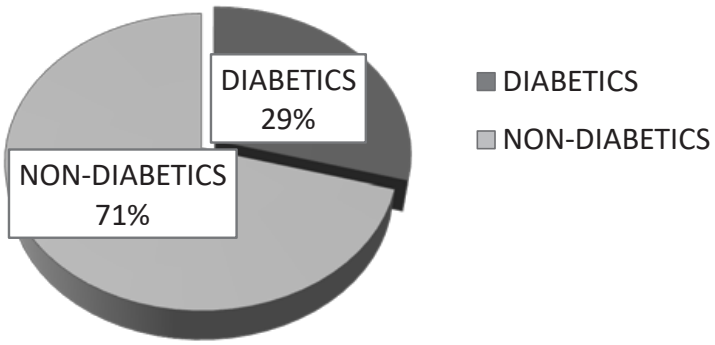

Figure 1 -Diabetics and non-diabetics in the study population

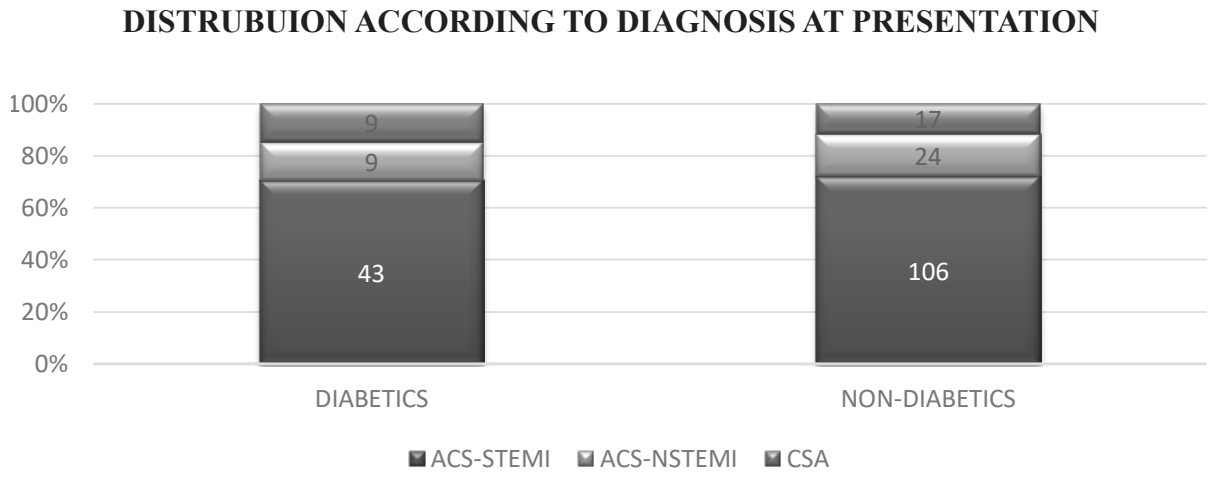

Figure 2- Distribution of patients according to diagnosis.

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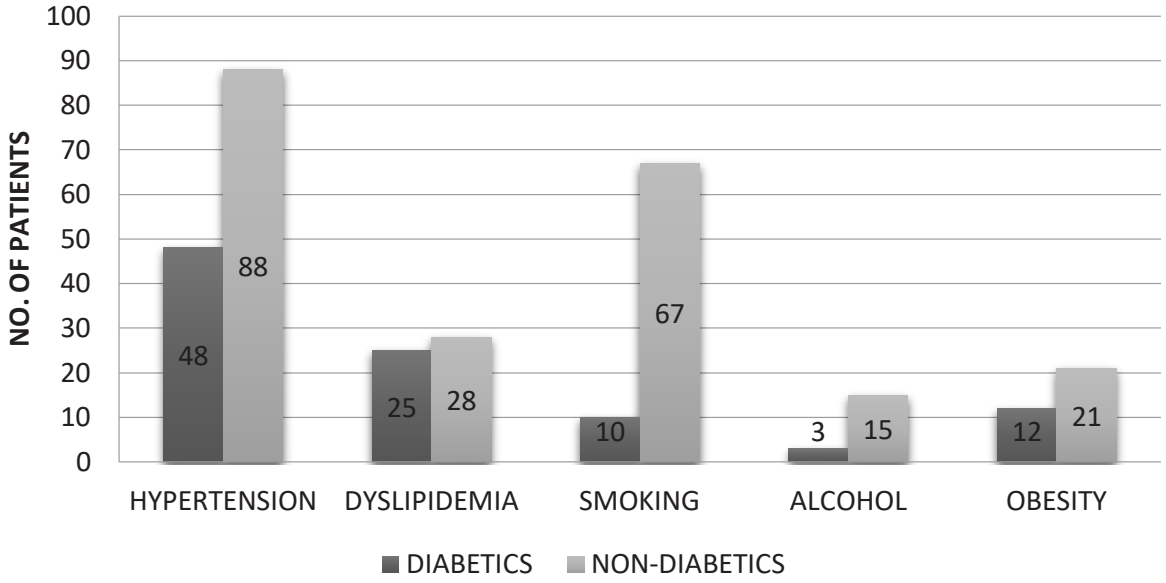

Figure 3-Distribution of risk factors in the diabetic and non-diabetic population

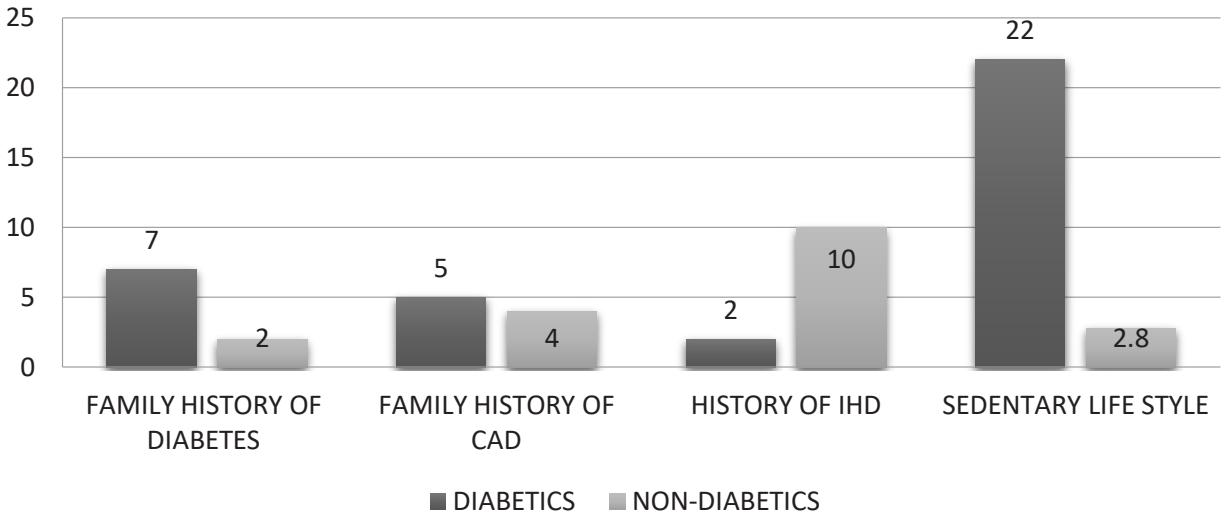

Figure 4-Distribution of risk factors in the diabetic and non-diabetic population

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Table 2: Angiographic characteristics of the study population in diabetic and non-diabetic patients.

GROUP	DIABETICS	NON-DIABETICS	P-VALUE
	61	147	
Number of diseased arteries (n, %)			
1-vessel disease	22(36.06%)	42(28.57%)	0.121
2-vessel disease	23(37.70%)	43(29.52%)	
3-vessel disease	10(16.39%)	26(17.68%)	
Mean number of diseased arteries	1.77	1.50	0.079
Location of diseased arteries (n, %)			
Left anterior descending coronary artery	54(88.52%)	98(66.67%)	0.194
Left circumflex coronary artery	25(40.93%)	54(36.83%)	
Right coronary artery	35(57.37%)	75(51.02%)	
Left main coronary artery	4(6.5%)	5(3.4%)	
Coronary atherosclerosis score			
Left anterior descending coronary artery	3(0,7)	2(0,7)	0.001
Left circumflex coronary artery	0(0,10)	0(0,6)	0.455
Right coronary artery	2(0,12)	1(0,9)	0.171
Left main coronary artery	0(0,3)	0(0,6)	0.932
Cumulative score	6(0,21)	4(0,19)	0.008

Values are n (%), mean SD, median (minimum, maximum), or as indicated

The age of the study population ranged from a minimum age of 32 years and a maximum of 85 years with a mean age of 56.5±9.8. Among the total enrolled patient 147(70.4%) were male and 61(29.3%) females. In the diabetic group, there were 38 males and 23 females. In the non-diabetic group, there were 106 males and 41 females. The difference in gender distribution between the two was non-significant (p=0.163).

There were 149 (71.6%) cases of acute coronary syndrome STEMI, 33 cases (15.9%) of NSTEMI, and 26 (12.5%) cases of stable Angina.

Among the patient included in the study, 136 (65.4%) were diagnosed as Hypertensive, and 72 (34.6%) were diagnosed as Non-Hypertensive.

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Hypertensive among the diabetic and non-diabetic populations were 48 (78.7%) and 88 (59.9%) respectively.

The mean SBP was 112.5±25.0 (SD) mmHg and the mean DBP was 73.9±13.1 (SD) mmHg among Diabetics. The mean SBP was 107.5± 18.5mmhg and DBP 71.6±11.9mmhg among the Non-diabetic group.

At the time of enrollment in the study 53(25.5%) were dyslipidemic. The diabetic group had 25 (40.9%) who were having dyslipidemia and the Non-diabetic group had 28 (19.1%) who were having dyslipidemia.

There were 10 (16.39%) and 67 (45.57%) smokers in diabetic and Non-diabetic groups respectively. The patients with family history of Diabetes mellitus were 7 (11.4%) among the diabetics and 2(1.36%) among the Non-diabetic group. The diabetic group had 5(8.19%) patients with a family history of Coronary artery disease. 4 (2.72%) patients in the non-diabetic group had a family history of coronary artery disease.

In our study population, 70 (33.7%) had a sedentary lifestyle. 48(32.6%) and 22 (36.1%) were having sedentary lifestyle among the diabetic group and non-diabetic group respectively.

Alcohol consumption was found in 18 (8.7%) of the study population. Among diabetics, 3(4.9%) were alcohol consumers whereas 15(10.20%) were in the non-diabetic population.
There were 33 (15.9%) who were obese among the study population of 208 patients. 12 (19.6%) were diabetics and 21 (14.28%) were non-diabetics.

The diabetic group had one-vessel disease in 36.06%, two-vessel disease in 37.70%, and three-vessel disease in 16.39 %. The non-diabetic group had one-vessel disease in 28.57%, two-vessel disease in 29.52% and three-vessel disease in 17.68% of patients. The Left anterior descending coronary artery was significantly more frequently involved in diabetics than non-diabetic patients (88.52% vs. 66.67% while there were no significant differences regarding the other coronary arteries between the two groups. The mean coronary Atherosclerosis score in the study population was 5.4± 4.2(SD).
The mean of coronary atherosclerosis score was 6.6±4.1 (SD) among the diabetics and 4.9±4.0(SD) among the non-diabetic patients.

DISCUSSION

The study was designed to find the extent and severity of coronary artery disease between diabetics and non-diabetics in patients referred for coronary angiography at a tertiary care center.
The mean age of patients in the present study was 59.5±10.1 among non-diabetics and 59.5±9.0 among the diabetic population which was non-significant. Compared to a study done in 2009 by Ming-hui et al,[7] where the mean age of the study population was 65±8.7 among the diabetics and among the non-diabetic group the mean age was 63.8±9.6. Our study population consisted of a younger population than the study mentioned above done in the Chinese population. The younger age group may be due to the presence of multiple risk factors and that southeast Asians develop IHD earlier than their western cohorts. The other reason is that we included all the patient referred for coronary angiography with the clinical diagnosis of the acute coronary syndrome and chronic stable angina whereas only case with proven coronary artery disease was included in their study.
Among the total enrolled patients 144(69.2%) were male and 64(30.7%) females. The male preponderance was most likely related to an increased risk of an acute coronary syndrome in males.
Comparing the baseline characteristics between the two groups it was found that the presence of other risk factors was also more in diabetic patients. Diabetic patients had significantly higher hypertension (p=0.006), dyslipidemia (p=0.001), and a family history of diabetes mellitus (p=0.003) with a significantly lower proportion of smokers (p

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value<0.001). This disparity in the two groups in relation to smoking might be because of reluctance to give a history of smoking by diabetes in a healthcare setting.

The Family history of diabetes was significant (p<0.001)in the diabetic group. When compared to other ethnicities, South Asians have a high prevalence of coronary artery disease and associated risk factors. This has largely been attributed to both an increased prevalence of traditional risk factors as well as higher levels of novel markers and biomarkers of risk.[8]

The family history of coronary artery disease (p value=0.086), history of ischemic heart disease (p value=0.321), obesity (p value=0.333), and sedentary lifestyle (p value=0.65) was comparable between the two groups.

While the comparison between the diabetics and non-diabetics group according to diagnosis at presentation was done. It was found that the distribution of patients according to ACS: STEMI, ACS: NSTEMI, and CSA was 70.5%, 14.75%, and 14.75% in the non-diabetic group and it was distributed as 72.10%, 16.32%, and 11.56% in the diabetic group. This is non-significant and hence both the groups were comparable according to diagnosis at the time of presentation.

The comparison of blood sugar levels at the time of presentation showed that the blood sugar level was significantly high (p value<000.1) which was obviously expected in the diabetic group compared to the non-diabetic group.

The diabetic patient had single vessel disease in 36.06%, double vessel disease in 37.70%, and triple vessel disease in 16.39 %. In the non-diabetic group, single vessel disease was 28.57%, double vessel disease in 29.52%, and triple vessel disease in 17.68% of patients. As regards the severity of CAD, the mean number of coronary arteries involved was more among diabetic patients than among non-diabetic patients.

The Left anterior descending coronary artery was significantly more frequently involved in diabetics than non-diabetic patients (88.52% vs. 66.67%,p= 0.002), while there were no differences regarding the other coronary arteries between the two groups.

In the study done by Melidoniset al[9].The CAD was more extensive in diabetics (mean 2.2 vessels, compared to 1.8 vessels in non-diabetics, p<0.01). The right coronary artery was affected more often in diabetics (p<0.01), as was the anterior descending artery in three-vessel disease (p<0.05).

As for the CAS, similar results were found that the score of the left anterior descending coronary artery was clearly higher in the diabetic group than the other (p= 0.001) and the cumulative CAS was also found to be significantly higher in the diabetic CAD patients compared with the non-diabetics (p= 0.008).

The mean coronary atherosclerosis score was 6.64+4.18 among diabetes and 4.97+4.07 among the non-diabetic group with a p-value of 0.008 which was statistically significant. Thus the severity of coronary atherosclerosis was more among the diabetics than among the non-diabetic population which was similar to the study done by Uddin et al. On 2005.

In the study done above in Mymensingh Medical College, Bangladesh comparison of patients with type 2 diabetes mellitus and coronary artery disease (CAD) was done with fifty non-diabetic patients with CAD. Diabetic patients had a higher CAS (11.74+/-5.04 vs 8.72+/-4.87; P<0.001) as compared to nondiabetic patients.[10] Thus the finding in their study was similar to our study. The CAS was more in their study as they included patients with coronary artery disease only.

Diabetic patients had more severe and extensive atherosclerotic lesions in their coronary arteries than the non-diabetic control on coronary angiography suggesting an independent effect of diabetes on the atherosclerotic process, especially in our population.

The limitation of our study is that all patients were taken from one center only. Analysis of coronary artery disease was performed by QCA (quantitative coronary angiography analysis) only. Data about intervention although present was not analyzed in this study as we wanted to study coronary involvement only. We have not taken into account various drugs that may have affected the result of the study. The burden of coronary atherosclerosis in the

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general population couldn't be estimated as a large portion of the population are asymptomatic and can be estimated only by comparing diabetic and non-diabetic patient from the general population.

CONCLUSION

Diabetic patients had more severe and extensive atherosclerotic lesions in their coronary arteries than the non-diabetic on coronary angiography suggesting a deleterious effect of diabetes mellitus on the atherosclerotic process, especially in our population.

AUTHOR CONTRIBUTION

KP has written the manuscript, collected data, done the calculations. VK helped in data calculation and collection, NRS also helped in data evaluation and writing manuscript, RM reviewing the documents and PK had reviewed the documents guide in preparing the manuscript.

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