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Study of Health Awareness Status among Diabetes Patients in Eastern India: A Relationship between Demographic and Socioeconomic Profiles along with Biochemical and Obesity Parameters

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Abstract

Aim: The present study evaluates the health awareness status of diabetes mellitus (DM) between urban and rural patients of eastern India related to demographic and socioeconomic status, biochemical profiles, and obesity parameter. **Materials and Methods:** We have randomly selected the data of 50 patients, minimum of 25 years of age and maximum age of 78 years among females (29 nos.) and males (21 nos.), who visited the endocrinology outpatient department of the hospital in Kolkata from the urban and rural area. All the data have been collected from clinical records and questionnaire survey to know health awareness among DM. **Results:** The frequencies (%) of demographic and socioeconomic status in urban (58%) and rural (42%) population were indicated that the female population was higher of about 65.52% from the urban area while lower of about 34.48% from the rural area. The biochemical profiles, namely, fasting blood glucose, PPBG and glycated hemoglobin, and body mass index were obtained higher value in the urban compared to rural patients. Regarding awareness, the urban patients were found more aware than the rural subjects ($P < 0.01$ and $P < 0.05$). **Conclusion:** The present study concludes that demographic and socioeconomic status may influence the prevalence of DM in urban subjects compared to a rural group. Interestingly, higher awareness was obtained in patients of urban area compared to the rural area. Moreover, this is a preliminary study, and the future study is suggested with more numbers of samples for the awareness and management practice of DM prevalence.

Keywords: Awareness of diabetes mellitus, Biochemical profiles, Demography and socio-economic features, Diabetes mellitus

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Introduction

The disease diabetes mellitus (DM) is classified into type-1 (due to islet beta-cell destruction) and type-2 (with varying degree of insulin resistance and/or insulin secretory defect). Besides these, other specific types of diabetes, namely, gestational diabetes and secondary diabetes are well-known. The pre-diabetes (intermediate hyperglycemia) occurrence is also found as borderline blood sugar level may lead to diabetes in the future.[1]

Moreover, self-monitoring blood glucose (SMBG) level is currently an important tool for diabetes care that helps patients,[2] but there are many barriers to the effective implementation of SMBG into routine clinical care that include poor education, gender difference, socio-economic profiles, due to unaffordability of using instrument, and difficulty in using the results to adjust insulin dosage.[2-6] On the other hand, fasting blood glucose (FBG), post-prandial blood glucose (PPBG), and glycated hemoglobin (HbA1c) are suitable biochemical tests that make the detection easy for DM.[7,8] Bays *et al*. reported that body mass index (BMI) is closely related to the prevalence of DM.[9]

Several studies have been carried out and different research reports, national and international, are available on the prevalence of diabetes based on demographic and socio-economic profiles. Sharkia *et al*. reported that education and income levels might have an increasing effect on the prevalence of T2DM in Israel.[10] Not only in Israel, but several studies are also available that confirm the demographic and socioeconomic influence on the prevalence of DM.[11-14]

Disease awareness particularly on DM has an extraordinary effect as a positive influence to prevent the disease and its comorbidities.[15-20] Unfortunately, not many studies have been carried out in eastern India regarding these important aspects, namely, biochemical characteristics, obesity, demographic, and socioeconomic profiles along with health status awareness.

The present study evaluates the health awareness status of DM between urban and rural patients of eastern India related to demographic and socioeconomic status, biochemical profiles, and obesity parameter.

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Materials and Methods

Study Design

The study was based on a total number of 50 DM patients (age group: 25–78 years) in which females (29 nos.) and males (21 nos.),

who visited the endocrinology outpatient department of hospital, Kolkata from different urban as well as rural areas. All the data were collected from clinical records and questionnaire-based survey was done in each patient to know health awareness on diabetes among urban and rural subjects.

Study Variables

The data on demographic and socioeconomic parameters, namely, age, sex, educational qualification, occupation, annual income, and residence were collected. As per clinical characteristics, the prevalence of DM based on the blood parameters such as FBG (mg/dl), PPBG (mg/dl), and HbA1c (%) and obesity parameter especially BMI (kg/m^2) was collected from hospital records. The questionnaire-based survey was done for health awareness and management regarding the prevalence of DM in the subjects from urban and rural areas and necessary consent was taken for each patient.

Statistical Analysis

The data were statistically analyzed using online software MedCalc (https://www.medcalc.org/calc/comparison_of_proportions.php). Percentage analysis was done to represent the data on age- and sex-specific prevalence of new and known DM in the urban and rural areas. An independent sample *t*-test was used to compare the blood markers, namely, FBG, PPBG, and HbA1c and obesity parameter, namely, BMI. The awareness of different parameters among patients was compared between urban and rural population. In statistical analysis, $P < 0.05$ was considered statistically significant.

Results

Demographic and Socioeconomic Profiles

Among 50 numbers of DM patients in the studied samples, the male and female ratio was 42:58, with a mean age of 52.2 ± 12.4 years.

The diabetes prevalence frequencies observed with the view of age distribution among female population between rural (17.24%) and urban (31.3% and 34.48%) area of <50 and >50 years while male population between rural (14.3% and 38.09%) and urban (19.05% and 28.57%) area of <50 and >50 was obtained, respectively [Figures 1 and 2].

The frequencies of overall genders [Figure 3], the female and male population between rural (34.48% and 52.38%) and urban (65.52 and 47.62) area were obtained.

The frequencies of the mixed population of religion were obtained 92% Hindu and 8% Islam for DM prevalence [Figure 4].

The frequencies of education level were obtained groups for secondary (24%), higher-secondary (14%), graduate (32%), post-graduate (12%), and no education or non-secondary (18%), respectively [Figure 5].

In the case of frequencies of occupation, the subjects were categorized into groups of no income (34%), business (18%), service (24%), teacher (8%), and others such as farmers, cook, and defense (16%), respectively [Figure 6].

The frequencies for management through medications, the subjects were categorized into groups for taking only insulin (4%), only oral tablet (32%), both insulin and oral tablet (36%), neither insulin nor oral tablet as none (28%), respectively [Figure 7].

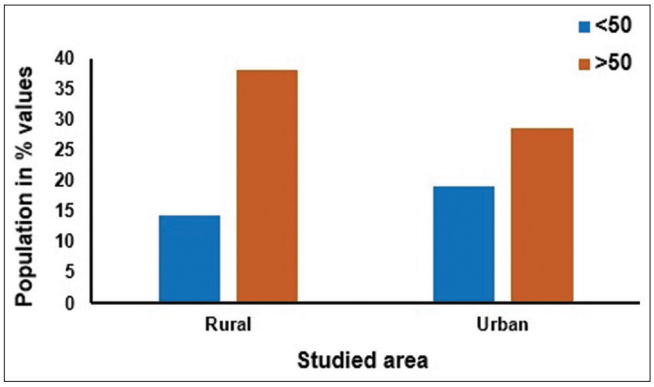

Figure 1: Age-specific prevalence of known diabetes mellitus in the rural and urban area (n = 29 for female)

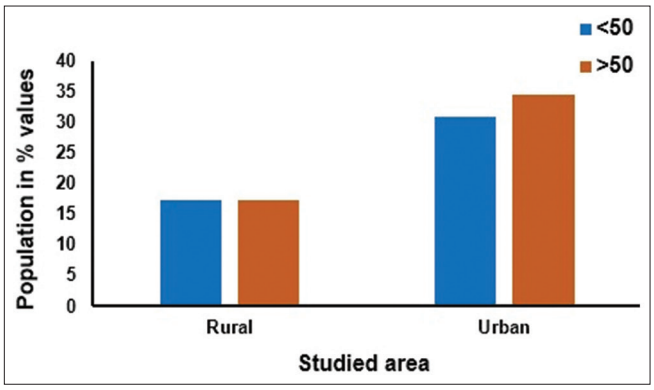

Figure 2: Frequencies of the age-specific prevalence of known diabetes mellitus in the rural and urban area (n = 21 for male)

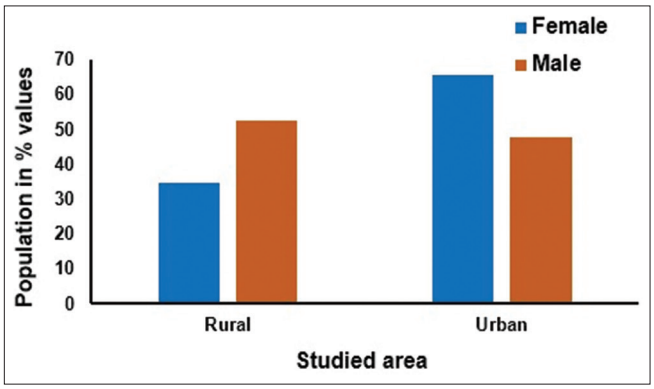

Figure 3: Frequencies of the gender-specific prevalence of known diabetes mellitus in the rural and urban area (n = 29 for female and n = 21 for male)

Comparative Study of Socioeconomic and Demographic, Biochemical, and Obesity Parameters on DM Prevalence

In the present study [Table 1], the frequencies (%) of socioeconomic and demographic profiles in urban (58%) and rural (42%) population were indicated that the female population was higher of about 65.52% from the urban area while lower of about 34.48% from the rural area and this was obtained statistically significant at $P < 0.05$ level. The male population was found lower (47.62%) in an urban area

while higher (52.38%) in a rural area, but the difference did not show statistical difference. The mean ± SD value for age groups revealed higher (53.43 ± 13.33) in a rural area while lower (51.31 ± 11.63) in an urban area without statistical change. In the case of the study of annual income level, higher income group was found in the urban area (17.24%) compared to rural area (9.53%), the moderate and lower-income group was found lower value in the urban area (27.59% and 17.24%) but higher in the rural area (33.33%) and the group of without income was higher in the urban area (37.93%) compared to rural area (23.81%). The comparison between urban and rural groups did not show any statistical difference. All the blood parameters (mean ± SD) such as FBG (mg/dl), PPBG (mg/dl), and HbA1c (%) values were obtained higher in the urban area (199.93 ± 89.66, 247.27 ± 92.27, and 8.46 ± 2.27) compared to rural area (186.62 ± 78.23, 217.19 ± 112.44, and 7.53 ± 2.20) without any statistical changes. The obesity parameter, namely, BMI (Kg/m^2) values lower in the urban area (25.02 ± 3.58) in comparison with the rural area (25.21 ± 3.74) without statistical difference.

Comparative Study on DM Awareness

The comparative analysis was done between the urban and rural population about awareness on different health issues to prevent DM prevalence [Table 2]. In case of awareness on hyperglycemic conditions, high awareness group was found higher in the urban area (65.52%) compared to rural area (23.81%) with a statistically significant change ($P < 0.01$), low awareness group was found lower value in the urban area (13.79%) compared to rural area (28.57%) without significant change, and no awareness group found lower value in the urban area (20.69%) in comparison with the rural area (47.62%) with a significant difference ($P < 0.05$). In case of awareness on lifestyle risks, high awareness group was found higher in the urban area (58.68%) compared to rural area (28.57%) with a statistically significant change ($P < 0.05$), low awareness group was found higher value in the urban area (17.24%) compared to rural area (14.28%) without significant change, and no awareness group found lower value in the urban area (24.14%) in comparison with the rural area (57.14%) with a significant difference ($P < 0.05$). The awareness on the symptoms of DM, high awareness group was found higher in the urban area (55.17%) compared to rural area (14.28%) with a statistically significant change ($P < 0.01$), low awareness group was found higher value in the urban area (13.79%) compared to rural area (9.52%) without significant change, and no awareness group found lower value in the urban area (31.03%) in comparison with a rural area (76.19%) with a significant change ($P < 0.01$). The awareness on hyperglycemia and organs damage, high awareness group was found higher in the urban area (62.07%) compared to rural area (33.33%) with a statistically significant change ($P < 0.05$), low awareness group was

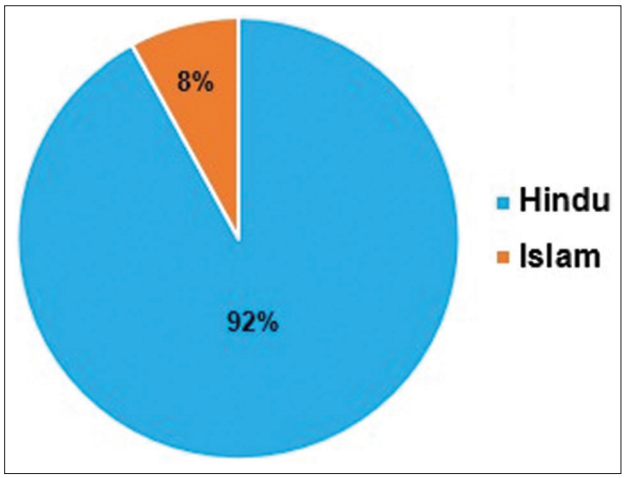

Figure 4: Frequencies of religion for the prevalence of known diabetes mellitus in the rural and urban area

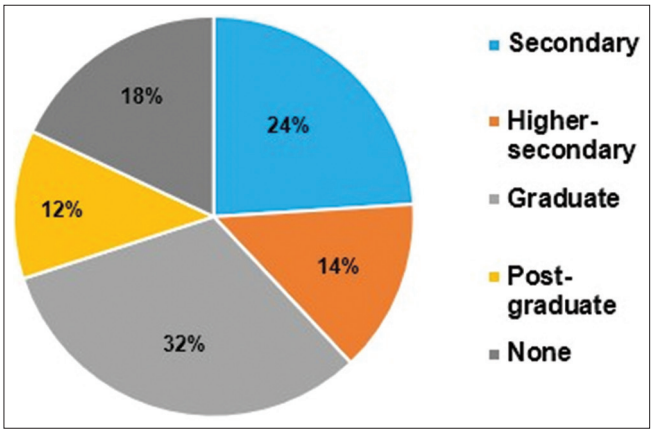

Figure 5: Frequencies of education for the prevalence of known diabetes mellitus in the studied population

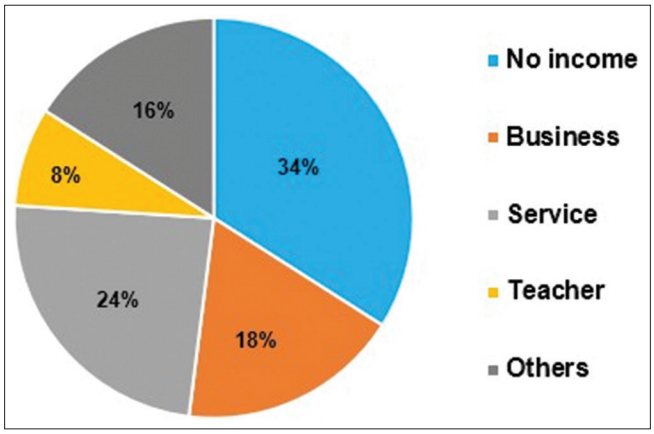

Figure 6: Frequencies of occupation for the prevalence of known diabetes mellitus in the studied population

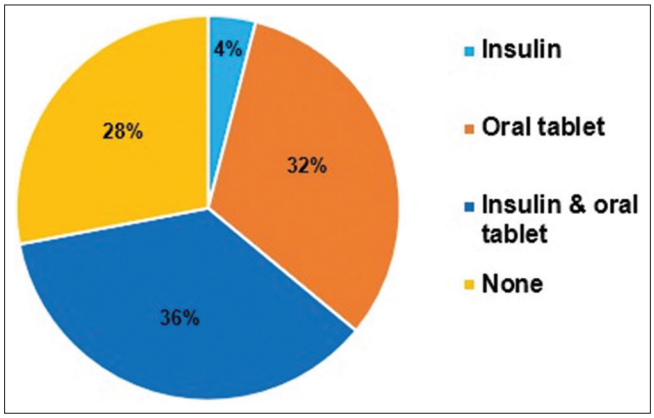

Figure 7: Frequencies of management for the prevalence of known diabetes mellitus in the studied population

found lower value in the urban area (3.45%) compared to rural area (9.52%) without significant change, and no awareness group found lower value in the urban area (34.48%) in comparison with a rural area (57.14%) without significant change. The awareness on monitoring of blood glucose levels in DM, high awareness group was found higher in the urban area (55.17%) compared to rural area (38.09%), low awareness group was found higher value in the urban area (10.34%) compared to rural area (4.76%), and no awareness group found lower value in the urban area (34.48%) in comparison with a rural area (76.19%). It was observed that all the comparisons study did not show any significant changes. The awareness on co-morbidity risks, high awareness group was found higher in the urban area (55.17%) compared to rural area (19.05%) with a statistically significant change ($P < 0.05$), low awareness group was found higher value in the urban area (41.38%) compared to rural area (14.28%) without significant change and no awareness group found lower value in the urban area (34.48%) in comparison with a rural area (76.19%) with a significant change ($P < 0.01$). The awareness on hypertension measurement, high awareness group was found higher in the urban area (24.14%) compared to rural area (14.28%) without significant change, low awareness group was found higher value in the urban area (41.38%) compared to rural area (14.28%) with a significant change at $P < 0.05$ level and no awareness group found lower value in the urban area (34.48%) in comparison with a rural area (71.43%) with a significant change ($P < 0.05$).

Table 1: Comparative study of socioeconomic and demographic, biochemical, and obesity parameters on DM prevalence

Variables	*Urban* *n (%)*	*Rural* *n (%)*	*P-value*
n (%)	29 (58)	21 (42)	
Gender female, *n* (%)	19 (65.52)	10 (34.48)	<0.05
Gender male, *n* (%)	10 (47.62)	11 (52.38)	NS
Age (Years) mean±SD	51.31±11.63	53.43±13.33	NS
Income			
High, *n* (%)	5 (17.24)	2 (9.53)	NS
Moderate, *n* (%)	8 (27.59)	7 (33.33)	NS
Low, *n* (%)	5 (17.24)	7 (33.33)	NS
None, *n* (%)	11 (37.93)	5 (23.81)	NS
Blood parameters			
FBG (mg/dl) mean±SD	199.93±89.66	186.62±78.23	NS
PPBG (mg/dl) mean±SD	247.27±92.27	217.19±112.44	NS
HbA1c (%) mean±SD	8.46±2.27	7.53±2.20	NS
Obesity parameter			
BMI (Kg/m^2) mean±SD	25.02±3.58	25.21±3.74	NS

DM: Diabetes mellitus, FBG: Fasting blood glucose, PPBS: Postprandial blood glucose, HbA1c: Glycated hemoglobin, BMI: Body mass index, NS: Non-significant, Urban and Rural (*n*=29 and 21)

Table 2: Comparative study of DM awareness

Categories	*Urban* *n (%)*	*Rural* *n (%)*	*P-value*
Hyperglycemic conditions			
High awareness, number (%)	19 (65.52)	5 (23.81)	<0.01
Low awareness, number (%)	4 (13.79)	6 (28.57)	NS
None, number (%)	6 (20.69)	10 (47.62)	<0.05
Lifestyle risks			
High awareness, number (%)	17 (58.62)	6 (28.57)	<0.05
Low awareness, number (%)	5 (17.24)	3 (14.28)	NS
None, number (%)	7 (24.14)	12 (57.14)	<0.05
Symptoms of DM			
High awareness, number (%)	16 (55.17)	3 (14.28)	<0.01
Low awareness, number (%)	4 (13.79)	2 (9.52)	NS
None, number (%)	9 (31.03)	16 (76.19)	<0.01
Hyperglycemia and organs damage			
High awareness, number (%)	18 (62.07)	7 (33.33)	<0.05
Low awareness, number (%)	1 (3.45)	2 (9.52)	NS
None, number (%)	10 (34.48)	12 (57.14)	NS
Monitoring of blood glucose levels in DM			
High awareness, number (%)	16 (55.17)	8 (38.09)	NS
Low awareness, number (%)	3 (10.34)	1 (4.76)	NS
None, number (%)	10 (34.48)	12 (57.14)	NS
Co-morbidity risks			
High awareness, number (%)	16 (55.17)	4 (19.05)	<0.05
Low awareness, number (%)	3 (10.34)	1 (4.76)	NS
None, number (%)	10 (34.48)	16 (76.19)	<0.01
Hypertension measurement			
High awareness, number (%)	7 (24.14)	3 (14.28)	NS
Low awareness, number (%)	12 (41.38)	3 (14.28)	<0.05
None, number (%)	10 (34.48)	15 (71.43)	<0.05

DM: Diabetes mellitus, NS: Non-significant, Urban and Rural (*n*=29 and 21)

Comparative Study on DM Management Practice

The comparative analysis was done between the urban and rural population about management practice regarding prevent DM prevalence [Table 3]. The awareness on the lifestyle management in DM, high awareness group was found higher in the urban area (72.41%) compared to rural area (42.86%) with a statistically significant change ($P < 0.05$), low awareness group was found higher value in the urban area (10.34%) compared to rural area (4.76%) without significant change and no awareness group found lower value in the urban area (17.24%) in comparison with a rural area (52.38%) with a significant change ($P < 0.01$). The awareness on eye care in DM, high awareness group was found higher in the urban area (58.62%) compared to rural area (28.57%) with a statistically significant change ($P < 0.05$), low awareness group was found higher value in the urban area (13.79%) compared to rural area (14.28%) without significant change, and no awareness group found lower value in the urban area (27.57%) in comparison with a rural area (57.14%) with a significant change ($P < 0.05$).

Table 3: Comparative study of DM management practice

Categories	*Urban* *N (%)*	*Rural* *N (%)*	*P-value*
Lifestyle management in DM			
High awareness, number (%)	21 (72.41)	9 (42.86)	<0.05
Low awareness, number (%)	3 (10.34)	1 (4.76)	NS
None, number (%)	5 (17.24)	11 (52.38)	<0.01
Eye care during DM			
High awareness, number (%)	17 (58.62)	6 (28.57)	<0.05
Low awareness, number (%)	4 (13.79)	3 (14.28)	NS
None, number (%)	8 (27.57)	12 (57.14)	<0.05
Care of diet and medications			
High awareness, number (%)	15 (51.72)	7 (33.33)	NS
Low awareness, number (%)	6 (20.69)	3 (14.28)	NS
None, number (%)	7 (24.14)	11 (52.38)	<0.05
Urine test for protein elimination			
High awareness, number (%)	8 (27.57)	2 (9.52)	NS
Low awareness, number (%)	9 (31.03)	3 (14.28)	NS
None, number (%)	12 (41.38)	16 (76.19)	<0.05
Exercise for DM management			
High awareness, number (%)	14 (48.27)	7 (33.33)	NS
Low awareness, number (%)	7 (24.14)	3 (14.28)	NS
None, number (%)	8 (27.57)	11 (52.38)	NS
Diet management on DM			
High awareness, number (%)	13 (44.83)	3 (14.28)	<0.05
Low awareness, number (%)	5 (17.24)	3 (14.28)	NS
None, number (%)	11 (37.93)	15 (71.43)	<0.05

DM: Diabetes mellitus, NS: Non-significant, Urban and Rural (N=29 and 21)

In case of awareness on the care of diet and medications, high awareness group was found higher in the urban area (51.72%) compared to rural area (33.33%) without significant change, low awareness group was found higher value in the urban area (20.69%) compared to rural area (14.28%) without significant change, and no awareness group found lower value in the urban area (24.14%) in comparison with a rural area (52.38%) with a significant change ($P < 0.05$). In case of awareness on a urine test for protein elimination, high awareness group was found higher in the urban area (27.57%) compared to rural area (9.52%) without significant change, low awareness group was found higher value in the urban area (31.03%) compared to rural area (14.28%) without significant change and no awareness group found lower value in the urban area (41.38%) in comparison with a rural area (76.19%) with a significant change ($P < 0.05$). In the case of awareness on exercise for DM management, high awareness group was found higher in the urban area (48.27%) compared to rural area (33.33%), low awareness group was found higher value in the urban area (24.14%) compared to rural area (14.28%), and no awareness group found lower value in the urban area (27.57%) in comparison with a rural area (52.38%). It was obtained that all the comparisons study did not show any significant changes. The awareness on diet management in DM, high awareness group was found higher in the urban area (44.83%) compared to rural area (14.28%) with a statistically significant change ($P < 0.05$), low awareness group was found higher value in the urban area (17.24%) compared to rural area (14.28%) without significant change and no awareness group found lower value in the urban area (37.93%) in comparison with a rural area (71.43%) with a significant change ($P < 0.05$).

Discussion

The prevalence of DM is influenced by demographic and socioeconomic profiles. According to Sharkia *et al*.,[10] the educational qualification and income levels may affect increasing the prevalence of T2DM in Israel. According to Walker *et al*.,[6] age-specific life expectancy was calculated based on stratified socioeconomic status for T2DM patients in Scotland. Other findings revealed that the prevalence of diabetes decreased with increasing level of education in Ghanaian men and women in Europe and men in urban Ghana while diabetes prevalence increased with increasing level of education in men and women in rural Ghana.[13] In an earlier study, among literate patients of Kolkata, India, the knowledge regarding diabetes was found not good and suggested to create awareness on diabetes.[12] However, in recent study indicated subjects are found highly aware in urban area compared to rural area. A study in rural communities observed the prevalence of DM was high due to the impact of socioeconomic transition in Kerala, India.[11] In the present study, the female population was higher than the male population, which is supported by Satman *et al*.[20] as well as the higher population was from urban area compared to the rural area. But Jangra *et al*.[21] reported that DM prevalence was higher in the rural part of Haryana, India due to lack of literacy and belong to upper-middle socioeconomic status engaged with service. The present findings observed a similarity that education is an important factor, which is lower in studied female patients of urban area and the prevalence of DM was observed an increasing level.[13] In the present study, a higher frequency of graduate education was observed, which may lead to more awareness of DM prevalence. Moreover, the biochemical parameters were observed as a high prevalence of DM. Although, the patients were taken both insulin and oral tablets at higher frequencies. Interestingly, in the present study, lower or no awareness was observed in the rural population compared to an urban population, which has similarities with previous works of Deepa *et al*.[16] and D'Souza *et al*.[17] According to them, awareness about diabetes was found to a poor, and very poor score.

Conclusion

It is concluded that demographic and socioeconomic profiles may influence the prevalence of DM in an urban area compared to a rural area. Interestingly, the present study is revealed that higher awareness groups were obtained in the urban population compared to the rural population. This is a preliminary study and suggested with a greater number of samples to study the management through awareness of DM prevalence in future.

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