

ORIGINAL ARTICLE

Diabetic foot wound care practices among patients visiting a tertiary care hospital in north India

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Abstract

Background: Diabetic foot syndrome is one of the most common and devastating preventable complications of diabetes resulting in major economic consequences for the patients, their families, and the society. **Aims & Objectives:** The present study was carried out to assess knowledge, attitude and practices of Diabetic Foot Wound Care among the patients suffering from Diabetic Foot and to correlate them with the socio-demographic parameters. **Material & Methods:** It was a Hospital based cross-sectional study involving clinically diagnosed adult (>18 years) patients of Diabetic Foot visiting the Surgery and Medicine OPDs at Teerthankar Mahaveer Medical College & Research Centre, Moradabad, India. **Results:** Significant association KAP (Knowledge, Attitude and Practices) score was seen with age of the patient, education, addiction, family history of Diabetes Mellitus, prior receipt of information regarding Diabetic foot-care practices, compliance towards the treatment and the type of foot wear used. **Conclusions:** The results highlight areas especially Health education, use of safe footwear and life style adjustments, where efforts to improve knowledge and practice may contribute to the prevention of development of Foot ulcers and amputation.

Keywords

Diabetic Foot Ulcer; Knowledge; Attitude; Practices; Wound Care

Introduction

India is known as Diabetes capital of the world. The estimate of 41 million people with diabetes in India affecting 10-16 % of urban population and 5.33-6.36 % of rural population is expected to rise to 66 million by 2025. (1,2) Diabetic foot syndrome is one of the most devastating preventable complications of diabetes. Various factors contributing to this syndrome are peripheral sensory neuropathy, improper footwear, lack of patient knowledge about foot care and uncontrolled diabetes. (3) Foot ulcers

are likely to have a neuropathic origin, and therefore eminently preventable, in developing countries, which will experience the greatest rise in prevalence of type 2 diabetes in the next 20 years. (4) The annual incidence of foot ulcers is nearly 2%. It is predicted that 15% of all patients of Diabetes will develop a foot ulcer in their lifetime, and foot ulcers are a major predictor of future lower extremity amputations in Diabetic patients. (5,6,7)

One of the critical elements of diabetes management is self-care. (8). A literature search on knowledge

about self-care of diabetes in developing countries yielded very few studies dealing with the awareness of diabetes among people with the disease (9,10) and virtually no data on a whole population.

Aims & Objectives

1. To assess knowledge, attitude and practices of Diabetic Foot Wound Care among the patients suffering from Diabetic Foot.
2. To correlate them with the socio-demographic parameters of the study subjects.

Material & Methods

Study design & Setting: This was a Hospital based cross-sectional study conducted at Teerthankar Mahaveer Medical College & Research Centre, Moradabad, India. **Study period:** 7 months, from January, 2016 to July, 2016. **Inclusion criteria:** Clinically diagnosed adult (>18 years) patients of Diabetes Mellitus type I and II visiting the Surgery and Medicine OPDs. Those who were suffering from a foot ulcer were included in the study. **Exclusion criteria:** Those patients who did not consent to the study were excluded. **Sampling method:** Non-probability purposive sampling technique was used. **Sample Size Calculation:** After doing a thorough Literature review (3-11), we came to the conclusion that the prevalence of correct knowledge of Diabetic Foot wound care practices ranges from 40-60%, As no similar study had been undertaken in the area, we took the expected prevalence of correct knowledge regarding Diabetic Foot wound care to be 50%, alpha 5% and chance error $\pm 15\%$, the sample size worked out to be 44.4. Further, taking a non-response rate of 10%, we finally took a sample of 50 patients. **Study Tool:** Pre-tested semi-structured Questionnaire adapted from the study by Chellan *et al* (11) and validated by the Faculty members at Department of Community Medicine, Teerthankar Mahaveer Medical College & Research Centre was used. The first part of structured questionnaire contained information on socio-demographic variables of the patients, family history, personal, present and past history of Diabetes Mellitus and the type of footwear they were using. For the purpose of this study, footwear was classified (3) as safe (bare foot, open chappals or sandals with forking, straps without back support, leather shoes without laces), and unsafe (straps with back support, leather shoes with laces, sports or canvas shoes and orthotic shoes). The second, third and fourth part of the questionnaire contained information on knowledge, attitude and

self-care practices containing 15 questions in total (knowledge-10, attitude-5 and practice-08 questions). Each correct answer was given a score of 'one' and each wrong answer was given a score of 'zero'. All the scores were added to give the total KAP (Knowledge, Attitude and Practices) Score which had the maximum value of 25 and a minimum value of 0.

Statistical Analysis: Data was analyzed using Statistical package for social sciences (SPSS) version 23.0 (IBM, Chicago, USA). Descriptive statistics as well as simple proportion were calculated for the data. Chi-square test, Fisher Exact probability test and logistic regression with 95% confidence interval to find the most important variable affecting diabetes related foot problems were used. The value of $p < 0.05$ was considered as significant for this study.

Ethical Issues: Permission from the Institutional Ethics Committee was taken. Written, informed consent was taken from all the study participants before the interview.

Results

Characteristics of patients and demographic profile:

A total of 50 patients consented and participated in the study of whom 38 (76.0%) were males and 12 (24.0%) females. Mean age of the participants was 59.8 ± 12.4 years with the range of 34 to 89 years. Out of the total study participants, 22 (44.0%) were Hindu and 22 (44.0%) were Muslims. Majority of them were; in the age group were above 60 years (50.0%), on oral hypo-glycaemic only (78.0%) and having family history of diabetes (76.0%). Of the 50 patients, 20 (40.0%) had received no formal education and 23 (46.0%) were either unemployed, housewives if females, or working as unskilled workers. 11 (22.0%) patients belonged to lower class, 34 (68.0%) to the middle class and 5 (10.0%) to upper class according to modified B G Prasad economic classification which is applicable for both urban and rural areas. Most of the respondents (52.0%) had a duration of illness between 6-10 years. Further break-up of the data by place of residence (rural/ urban areas) is shown in [Table 1](#).

Knowledge, attitude and Practice Scores: As shown in [Table 2](#), the maximum knowledge score was found in the age group 40-50 years (4.33 ± 1.75), Female sex (3.91 ± 2.11), rural residence (3.83 ± 1.95), semi-skilled/ skilled area of work (4.14 ± 1.87), Intermediate and above (4.92 ± 1.89), religion other than Hindu or Muslim (4.50 ± 2.26), living alone (4.20 ± 2.14) and belonging to socio-economic class IV

(5.25±1.90). As far as attitude was concerned, the maximum score was found in the age group of more than 60 years (2.64±1.11), Female sex (3.0±1.13), urban area of residence (2.76±0.76), semi-skilled/skilled worker (2.64±1.22), Intermediate and above level of education (3.14±1.17), religion other than Hindu or Muslim (3.00±1.09), living in a joint family (2.54±0.93) and belonging to socio-economic class II (2.92±0.86). Among the practices, maximum score was of participants of age group above 60 years (4.48±1.45), Female sex (3.75±1.48), urban area of residence (4.04±1.54), semi-professional/professional work (4.23±1.87), Intermediate and above education (4.43±1.63), Muslim by religion (3.95±1.70), living alone (4.62±2.13) and belonging to socio-economic class IV (4.62±1.50). [Figure 1](#) shows a Box-plot graph showing the variance of Knowledge, Attitude and Practices Score with the categories of KAP score.

Association of KAP score with Background History:

As shown in [Table 3](#), KAP score maximum=25, minimum=0 (good>10, poor≤10) was seen for association with background variables and history. Significant association ($p<0.05$) was seen with age of the patient, education, addiction (smoking, tobacco chewing or both), family history of Diabetes Mellitus, prior receipt of information regarding Diabetic foot-care practices, compliance towards the treatment and the type of foot wear used. The association with sex, area of residence (rural/ urban), occupational work involving excessive use of feet, religion, type of family, socio-economic class, type of Diabetes mellitus (I/II), duration of Diabetes Mellitus, presence of co-morbidities such as Hypertension, Obesity (BMI>40), cardiovascular disease or others like Reno vascular disease etc. and presence of other complications of diabetes Mellitus were not found to be significant ($p>0.05$).

On application of Univariate logistic regression, we found that the odds of having good score at an early age was less compared to that in older age group (>60 years). It was found to be 0.786 (95% CI- 0.132-4.680) and 0.196 (95% CI- 0.044-0.873) in the age groups 41-50 and 51-60 respectively. The odds ratio seen in the female sex was 1.095 (95% CI- 0.293-4.09) compared to the male sex, rural areas was 0.583 (95% CI- 0.185-1.836) compared to urban areas, 1.152 (95% CI- 0.360-3.680) in persons who used to work in those occupations which involve excessive use of feet like farmers, labourers, watchmen, rickshaw pulling etc. When compared to

the education level, a significant association was found and compared to the persons who had received higher education (Intermediate, graduation or above), the odd's ratio was 0.044 (95% CI- 0.007-0.287) in illiterates and 0.400 (95% CI- 0.088-1.826) in those having primary, middle, high school education. Stress plays an important role in the pathophysiology of Diabetes Mellitus. Living alone without a family and lower socio-economic status are related to stress and therefore we tried to find any association between the family type and socio-economic status of patient used to live in and his knowledge, attitude and practices regarding foot care. This was, however, not found to be significant. The odd's ratio in smokers/ tobacco chewers and those with a positive family history of Diabetes Mellitus was significant and found to be 0.249 (95% CI 0.073-0.845) and 0.231 (95% CI 0.058-0.919) respectively. Type of Diabetes Mellitus (Type I/II) did not show a significant association although the odds were 2.316 (95% CI 0.616-8.700). Duration (time since diagnosis) of Diabetes Mellitus was 1.250 (95% CI 0.058-0.919) in those having a recent diagnosis (<1 year), 0.375 (95% CI 0.059-2.366) and 1.071 (95% CI 0.233-4.919) compared to those having duration >10 years. The association between the receipt of information regarding care of foot, compliance to treatment, type of footwear being worn by the patient was found to be significant and the odd's ratio were 4.846 (95% CI 1.075-21.842), 0.012 (95% CI 1.376-15.823) and 0.015 (95% CI 1.652-25.575) respectively.

It is usually seen that patients of Diabetes Mellitus is usually associated with co-morbidities like Hypertension and Obesity, and the condition presents as Metabolic syndrome. The odd's ratio for presence of co-morbidities when seen for their association with the KAP score were 2.286 (95% CI 0.609-8.579), 1.371 (95% CI 0.254-7.392), 4.571 (95% CI 0.354-59.106) for Hypertension, Obesity and cardio-vascular disease respectively. Other complications of Diabetes Mellitus (Retinopathy, nephropathy, skin changes etc.) were seen in 10 (20%) patients and the odd's ratio was 0.600 (95% CI 0.149-2.421) and it was not found to be significant ($p>0.05$).

Discussion

Diabetic foot ulcer were found to be more common in males compared to females. The supportive data was seen in other similar as they indicate males

dominate in having diabetes with foot infections when compared to females (12-14). This could be due to gender related factors that affect the skin and differences in professional activity predispose the male patients to foot ulcer (1). The number of diabetic patients taking appropriate foot care was suboptimal in this study and discovered discrepancies in their performance. The available scientific knowledge concerning diabetes mellitus is an important resource to guide and educate diabetes patients concerning self-care. The mean knowledge score in our study was 3.7 ± 1.81 SD out of a maximum 10, which is far below the expected. The CURES study in Chennai showed that only 75.5% knew about a condition called diabetes, 40.6% were aware that diabetes could produce some complications. (11) For the patients who suffer from the complications, it becomes extremely important to prevent further damage. Our study showed that the overall scores for knowledge, attitude and practices for Diabetic Foot care were low (below 50% of the maximum score). In a study done in urban Mumbai, 57% diabetics had awareness about footwear, foot care and knowledge of symptoms relating to diabetic foot. (3) Another study in Gujrat documented that 46% of patients knew the pathophysiology of diabetes and 50% knew the complications of diabetes. (15) These results are poor compared to the studies done in Thailand and Tanzania which reported higher scores. (16-17)

Regarding Attitude, the mean score was 2.6 ± 0.98 SD out of a maximum score of 5 in this study, however, reports from Malaysia revealed good attitude with 98% of study participants scoring above 50 %. (18) The present study reports the mean practice score of 3.74 ± 1.53 SD in the patients studied out of a maximum of 10. In Sri Lanka, Perera *et al* (19) indicated that they found gaps in knowledge regarding the symptoms of poor control and the importance of regular follow-up. It seems that there are differences between countries regarding the knowledge gap, which may arise from health providers or from the patients. The need for regular follow-up visits is one of the common factors to stress on. (20)

Literacy and Socioeconomic status play an important role in proper foot care practice. Our study revealed a highly significant relationship with education status but not with the socio-economic status. Patients with a low education level have a higher risk of developing foot problems as they seek less the

health services and are not interested in changing their lifestyles (21-22). Yekta *et al.* reported that low income affects the utilization of health services. (23) Addiction to smoking and tobacco chewing is shown to have a direct effect on to KAP score in the present study. This is supported by various studies done in various countries including India. (24-26)

Our study showed a highly significant association of KAP score with the selection of appropriate foot wear, and previously received advice on foot care. This has been shown by various studies. (17,26) A number of studies have shown the beneficial effects of foot care education. (26-29) A study documented that patients who received the intervention of intensive education were less likely than control patients to have serious foot lesions. (26) In a study by Barth *et al.* (27), it was found that patients who had received previous education showed greater reduction in the number of foot problems requiring treatment in comparison with patients in the control group. Our study showed a similar pattern and a significant association.

Selection of appropriate footwear is important for preventing the development of foot ulcers (3, 28-31). Our study showed that KAP score is significantly associated with use of safe footwear. Vast majority of Indians use open footwear, called chappals. This has no heel counter and there is forking of toes by a divider. (3) According to a study by Pollock *et al* (31), barriers to practice of foot care were mainly due to co-morbidity. In our study, it is shown that presence of co-morbidities decreases the KAP score although it was not found to be significant.

Conclusion

This study strengthens the scope for improving foot care and footwear practices in the Indian diabetics and highlights the ignorance in foot care knowledge and practices, the emphasis on lifestyle modifications which contribute profoundly to the susceptibility of the patient for the development of diabetic foot and further injury and infection. Possibly effective interventions include optimizing glycemic control, smoking cessation and intensive podiatric care. Allocation of resources and training of health providers to ensure regular foot examination and foot education must be a priority of any strategy to control diabetes. (32) Patients of Diabetes Mellitus are usually dependent on drugs and diet for disease control while ignoring other healthy lifestyle

modifications in practical. The lack of awareness can be critical in the development of complications.

Recommendation

There should be an extra emphasis on patient education of all Diabetes patients regarding awareness of avoidable complications and their prevention by following good foot care practices. Considering the results of present study, great efforts would be needed by health teams to enhance education and improve the knowledge of the diabetics in our country. To ensure the continuation and maintenance of foot self-care, the family members should be encouraged to oversee the patients. Further, more studies revealing the role of cultural and traditional practices in the pathophysiology of Diabetic foot ulcers are required to be carried out in the community.

Limitation of the study

The study was conducted in a tertiary care hospital and thus does not reflect the true burden of Diabetic Foot care in the entire community.

Relevance of the study

The study findings highlight the need for appropriate health education services to all patients of Diabetes Mellitus.

Authors Contribution

All the authors had made substantial contributions to conception, design, data collection, analysis and interpretation of data; drafting the article, revising it critically for important intellectual content; and final approval of the version to be published.

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Tables

TABLE 1 SOCIO-DEMOGRAPHIC PROFILE OF THE STUDY PARTICIPANTS

	Number of participants (Percentage)		† p value
	Rural *N (%)	Urban N (%)	
Age			
<40	1 (25)	3 (75)	0.198
41-50	5 (83.3)	1 (16.7)	
51-60	8 (53.3)	7 (46.7)	
>60	10 (40.0)	15 (60.0)	
Sex			
Female	4 (33.3)	8 (66.7)	0.203
Male	20 (52.6)	18 (47.4)	
‡ Work (Occupation)			
Unemployed/ unskilled worker/ Housewife	11 (47.8)	12 (52.2)	0.624
Semiskilled/ Skilled worker	8 (57.1)	6 (42.9)	
Semi-professional/ Professional worker	5 (38.5)	8 (61.5)	
Education			
Illiterate	10 (50)	10 (50)	0.190
Primary/ Middle/ High School	5 (31.2)	11 (68.8)	
Intermediate and above	9 (64.3)	5 (35.7)	
Religion			
Hindu	10 (45.5)	12 (54.5)	0.621
Muslim	10 (45.5)	12 (54.5)	
Others	4 (66.7)	2 (33.3)	
Type of family			
Nuclear	15 (93.8)	1 (6.2)	0.000
Joint	8 (33.3)	16 (66.7)	
Living alone	1 (10)	9 (90)	
† Socio Economic Class			
I	2 (40)	3 (60)	0.607
II	4 (30.8)	9 (69.2)	
III	7 (53.8)	6 (46.2)	
IV	5 (62.5)	3 (37.5)	
V	6 (54.5)	5 (45.5)	

TABLE 2: TABLE SHOWING DISTRIBUTION OF MEAN KNOWLEDGE, ATTITUDE AND PRACTICE (MEAN ± SD) SCORES ACCORDING TO SOCIO-DEMOGRAPHIC VARIABLES

	Knowledge score Mean ± SD	Attitude Score Mean ± SD	Practice score Mean ± SD
Age			
<40	1.5±0.58	2.25±0.5	2.75±0.96
40-50	4.33±1.75	3.33±1.03	3.83±1.47
51-60	2.9±1.33	2.33±0.72	2.73±1.16
>60	4.4±1.76	2.64±1.11	4.48±1.45
Sex			
Male	3.71±1.73	2.47±0.92	3.73±1.57
Female	3.91±2.11	3.0±1.13	3.75±1.48
Place of Residence			
Rural	3.83±1.95	2.41±1.18	3.41±1.50
Urban	3.69±1.72	2.76±0.76	4.04±1.54
‡ Work (Occupation)			
Unemployed/ unskilled worker/ Housewife	3.5±1.44	2.56±0.79	3.39±1.37
Semiskilled/ Skilled worker	4.14±1.87	2.64±1.22	3.85±1.41
Semi-professional/ Professional worker	3.77±2.35	2.62±1.12	4.23±1.87
Education			
Illiterate	2.50±1.10	2.20±0.77	3.51±1.31
Primary/ Middle/ High School	4.31±1.54	2.62±0.89	3.87±1.54
Intermediate and above	4.92±1.89	3.14±1.17	4.43±1.63
Religion			
Hindu	3.18±1.22	2.27±0.77	3.72±1.27
Muslim	4.13±2.08	2.81±1.09	3.95±1.70
Others	4.50±2.26	3.00±1.09	3.00±1.78
Type of family			
Nuclear	3.43±1.50	2.50±1.03	3.06±1.48
Joint	3.79±1.88	2.54±0.93	3.75±1.22
Living alone	4.20±2.14	2.90±1.10	4.80±1.81
† Socio Economic Class			
I	3.3±1.30	1.80±0.83	3.40±2.07
II	3.79±1.73	2.92±0.86	3.84±1.34
III	3.07±1.66	2.46±0.66	3.53±1.05
IV	5.25±1.90	2.75±1.39	4.62±2.13
V	3.73±1.84	2.63±1.12	3.36±1.50

‡ Adapted from Kuppuswamy's Socioeconomic Status Scale (2016) (33)

† Modified B. G. Prasad Classification (2014) (34)

TABLE 3 ASSOCIATION OF KAP (KNOWLEDGE, ATTITUDE AND PRACTICE) SCORE WITH BACKGROUND HISTORY & PATIENT BEHAVIOR

	Poor Score KAP score ≤ 10 * N (%)	Good Score KAP score >10 * N (%)	† p value	Odd's Ratio	95% Confidence limits (Lower limit-Upper limit)
Age					
<40	4 (100.0)	0 (0.0)	0.044	0.000	0.000
41-50	3 (50.0)	3 (50.0)		0.786	0.132-4.680
51-60	12 (80.0)	3 (20.0)		0.196	0.044-0.873
>60	11 (44.0)	14 (56.0)		1 (ref)	
Sex					

	Poor Score KAP score ≤ 10 * N (%)	Good Score KAP score >10 * N (%)	† p value	Odd's Ratio	95% Confidence limits (Lower limit-Upper limit)
Female	7 (58.3)	5 (41.7)	0.575	1.095	0.293-4.09
Male	23 (60.5)	15 (39.5)		1 (ref)	
Area of Residence					
Rural	16 (66.7)	8 (33.3)	0.263	0.583	0.185-1.836
Urban	14 (53.8)	12 (46.2)		1 (ref)	
Work involving excessive use of feet					
Yes	11 (57.9)	8 (42.1)	0.522	1.152	0.360-3.683
No	19 (61.3)	12 (38.7)		1 (ref)	
Highest level of Education received					
Illiterate	18 (90.0)	2 (10.0)	0.001	0.044	0.007-0.287
Primary/ Middle/ High School	8 (50.0)	8 (50.0)		0.400	0.088-1.826
Intermediate and above	4 (28.6)	10 (71.4)		1 (ref)	
Religion					
Hindu	14 (63.6)	8 (36.4)	0.827	0.571	0.093-3.530
Muslim	13 (59.1)	9 (40.9)		0.692	0.113-4.239
Others	3 (50.0)	3 (50.0)		1 (ref)	
Type of family					
Nuclear	12 (75.0)	4 (25.0)	0.202	0.222	0.041-1.212
Joint	14 (58.3)	10 (41.7)		0.476	0.106-2.141
Living alone	4 (40.0)	6 (60.0)		1 (ref)	
† Socio Economic Class					
I	3 (60.0)	2 (40.0)	0.285	1.778	0.192-16.492
II	6 (46.2)	7 (53.8)		3.111	0.559-17.330
III	10 (76.9)	3 (23.1)		0.800	0.126-5.092
IV	3 (37.5)	5 (62.5)		4.444	0.631-31.294
V	8 (72.7)	3 (27.3)		1 (ref)	
Addiction (Smoking/ tobacco chewing)					
Yes	23 (71.9)	9 (28.1)	0.024	0.249	0.073-0.845
No	7 (38.9)	11 (61.1)		1 (ref)	
Type of DM					
I	11 (73.3)	4 (26.7)	0.173	2.316	0.616-8.700
II	19 (54.3)	16 (45.7)		1 (ref)	
§ Family History of DM					
Yes	26 (68.4)	12 (31.6)	0.035	0.231	0.058-0.919
No	4 (33.3)	8 (66.7)		1 (ref)	
Duration of DM					
<1 year	1 (50.0)	1 (50.0)	0.548	1.250	0.058-26.869
1-5 years	10 (76.9)	3 (23.1)		0.375	0.059-2.366
6-10 years	14 (53.8)	12 (46.2)		1.071	0.233-4.919
>10 years	5 (55.6)	4 (44.4)		1 (ref)	
Received information on Diabetic Foot care practices previously					
Yes	3 (30.0)	7 (70.0)	0.036	4.846	1.075-21.842
No	27 (67.5)	13 (32.5)		1 (ref)	
Treatment Compliance					
Taking regularly	10 (41.7)	14 (58.3)	0.012	4.667	1.376-15.823
Non- Compliant	20 (76.9)	6 (23.1)		1 (ref)	
Type of footwear					
Safe	4 (30.8)	9 (69.2)	0.015	6.5	1.652-25.575
Unsafe	26 (70.3)	11 (29.7)		1 (ref)	

	Poor Score KAP score ≤ 10 * N (%)	Good Score KAP score >10 * N (%)	† p value	Odd's Ratio	95% Confidence limits (Lower limit-Upper limit)
Co-morbidities present					
Hypertension	8 (50.0)	8 (50.0)	0.4844	2.286	0.609-8.579
Obesity (BMI>40)	5 (62.5)	3 (37.5)		1.371	0.254-7.392
Cardio vascular Disease	1 (33.3)	2 (66.7)		4.571	0.354-59.106
Absent	16	7		1 (ref)	
Other Complications present					
Yes	5 (50.0)	5 (50.0)	0.355	0.600	0.149-2.421
No	25 (62.5)	15 (37.5)		1 (ref)	

* N= Number of study participants
 † Chi-square test/ Fisher exact probability test
 ‡ Modified B. G. Prasad Classification (2014) [34]
 § Parents/ siblings/ first degree relatives
 || Body Mass Index= Weight in Kilograms/ (Height in centimeters)2

Figures

FIGURE 1 BOX-PLOT SHOWING THE VARIANCE OF KNOWLEDGE, ATTITUDE AND PRACTICE SCORES AGAINST TOTAL SCORE CATEGORIES (GOOD SCORE >10, POOR SCORE ≤10)

