

# Skin and Soft Tissue Infections Among the Diabetic Patients in Faridpur, Bangladesh

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## ABSTRACT

Diabetic is now a day's most prevalent endocrine disorder; the number of occurrences increases day by day. In our country the new case of diabetic mellitus is remarkably increases in every year. Due to the pathophysiology of this disease, diabetic patient is more susceptible to infection, and they are more prone to develop complicated skin and soft tissue infections. The study was conducted among the diabetic patients in Faridpur Diabetic Association Medical College from April to September 2019. The present study has been done on the skin and soft tissue infections among the diabetic patients in Faridpur district. Among the respondent the highest percentage of the respondent's sufferings from type- 2 diabetic mellitus about (81.8 %), (14.9 %) sufferings from type-1 diabetic mellitus. Out of 121 respondents, 60 (49.6%) were male and 61 (50.4%) were females. Among the respondent the highest percentage of the respondents are not suffering from skin and soft tissue infection (73.6%), only 26.4 % are sufferings from skin and soft tissue infection. The incidence of skin and soft tissue infection was relatively more frequent among the patients whose blood glucose level was poorly controlled and uncontrolled.

## Introduction and Background

Diabetes was one of the first described [1] which is a heterogeneous group of diseases characterized by chronic elevation of glucose in the blood. Diabetes affects some 300 million people world-wide and is on the increase. Chronic exposure to high blood glucose is a leading cause of renal failure, visual loss and a range of other types of tissue damage [2]. About 422 million people have diabetes worldwide [3] up from an estimated 382 million people in 2013 [4]. In 2014, the International Diabetes Federation (IDF) estimated that diabetes resulted in 4.9 million deaths worldwide, [5] where more than 80% of diabetic deaths occurred [6-10]. Approximately 85% of those with diabetes; they are usually older, but it is increasingly diagnosed in children and adolescents. Type 2 diabetes is associated with excess body weight and physical inactivity [11]. In 2013, WHO stated that early diagnosis can be accomplished through relatively inexpensive blood testing.

Impetigo and cellulites and chronic skin ulcers are associated with diabetics which are: Streptococcus group A, Staphylococcus aureus, anaerobic oral flora (*Prevotella*, *Fusobacterium* and *Peptostreptococcus spp.*) Around oral area and head and neck Colonic flora: Enterobacteriaceae and anaerobes (i.e. *Escherichia coli* and *Bacteroides fragilis* group) around rectum and lower extremity Necrotizing fasciitis, Streptococcus group A (rarely also groups C or E), Staphylococcus aureus, Enterobacteriaceae. Enteric or oral anaerobes cause Gas gangrene and crepitus cellulites Clostridium perfringens and other *Clostridium species*, *Progressive bacterial gangrene-Peptostreptococcus spp*, *Microaerophilic streptococci*, *Proteus spp*, *Myositis- Staphylococcus aureus*, *Streptococcus groups A, B, C and G*, *Enterobacteriaceae*, *Yersinia enterocolitica*, *Pseudomonas spp.*; *Aeromonas spp.* *Clostridium spp*, *Peptostreptococcus spp.* *Bacteroides spp* [12].

**Necrotizing fasciitis:** Necrotizing fasciitis (NF) is a rapidly progressive inflammatory infection of the fascia, with secondary necrosis of the subcutaneous tissues. The speed of spread is directly proportional to the thickness of the subcutaneous layer. The perineum, trunk, abdomen and upper extremities are most commonly involved in Necrotizing fasciitis [13]. In soft-tissue infections, foot infections are the most common soft tissue infections in patients with diabetes. In DM, fasciitis is characterized by poly-microbial growth, with single anaerobic and multiple aerobic microorganisms [14,15].

**Fungal and yeast infections:** In diabetic individuals, mycotic infections might elevate the risk of manifesting diabetic foot syndrome [16]. Patients with improperly controlled diabetes disease are more prone to Mucocutaneous Candida infections. Perleche remains atypical warning of diabetes onset in children [17]. Recent studies have shown a statistically significant relationship between the most common dermatophyte infections like *Epidermophyton floccosum* and *Trichophyton mentagrophytes*, *Trubrum* with diabetes [18].

### Viral Infections

Since long time, viruses have been suggested as a potential environmental trigger for DM (typically type-1 diabetes). Viruses belonging to the Enterovirus genus have the capacity to initiate and/or accelerate islet autoimmunity but cannot fully explain the etiology as a sole environmental trigger [19]. In the present investigation, the main objective was

- a) Identification of skin diseases including the fungal and bacterial infections among the diabetic patients in DAMCH.
- b) Prevalence of skin diseases in different age and sexes groups,
- c) The prevalence of skin and soft tissue infections in earlier diagnosed age group and long-standing diabetic patients and
- d) Variations of prevalence of skin and soft tissue infections among the different type of diabetic patients. sand muscular.

**Justification of this study:** Skin and soft-tissue infections (SSTIs) are common reasons to seek medical care in the inpatient and outpatient settings. There were an estimated 869,800 hospital admissions in the hospitals for SSTIs in 2004 [20]. Several investigations have noted that the incidence of SSTIs is increasing in both the inpatient and outpatient settings in the U.S. during the first decade of the 21<sup>st</sup> Century, with increases of 29% in the inpatient setting over a 4-year period and 50% in the outpatient setting over an 8-year period [21].

## Materials and Methods

The study was conducted at Diabetic Association Medical College Hospital Faridpur. This study period was from April 2017 to September 2019). The study population will be all diabetic patient who admit in this hospital. A pretested semi-structured interview questionnaire with both, open-ended and closed-ended was used to collect data. The statistical package for social sciences (SPSS) version 22.0 will be used to analyze the data. Obtained data will be evaluated by frequency and percentages ratios, Chi-square ( $\chi^2$ ), logistic regression analyses etc.

### Data Collection

Face-to-face interview was taken using the questionnaire. Respondents was provided a detailed explanation of each question in the local language.

### Data Processing and Analysis:

At the end of each day of data collection, each questionnaire was checked whether the questionnaire is filled completely and consistently. Data cleaning and editing was done and missed values statistically handled to help address concerns caused by incomplete data using SPSS statistical package. Data analysis was done on the basis of the research question and the objectives. The statistical package for social sciences (SPSS) version 22.0 was used to analyze the data. Obtained data was evaluated by frequency and percentages ratios, Chi-square ( $\chi^2$ ), logistic regression analyses etc. Different types of graphs, figures and tables were summarizing the data visually. Testing was be done using the 0.05 level of significance.

## Results

Out of 121 respondent 60 (49.6) were male respondent and 61 (50.4%) were female respondent (Table 1). The participation of the female respondents was higher than the male respondent. Among the respondent the highest percentage of the respondent were around 46- 55 years old (31.4%) following by the more than 56 years old (29.8%),36-45 years age about 19 %, age 26-35 years age was about 13 % and 16-25 years old 6.6% (Figure 1) (Tables 2&3). Among the respondent the highest percentage were used to take oral medication, 36.40% insulin, 14% through exercise and 7.40% controlled only by diet control (Figure 2). According to Table 2, practiced mild exercise 53.7%, 35.5 % moderate exercise, 2.5 % did heavy exercise and 10 (8.3%) without exercise Among the respondent the highest percentage of the respondents sufferings for 2-4 years about 39.7 %, 30.6 % for 5- 10 years, 15.7 are newly diagnosed case and 14% up to 10 years (Figure 3).

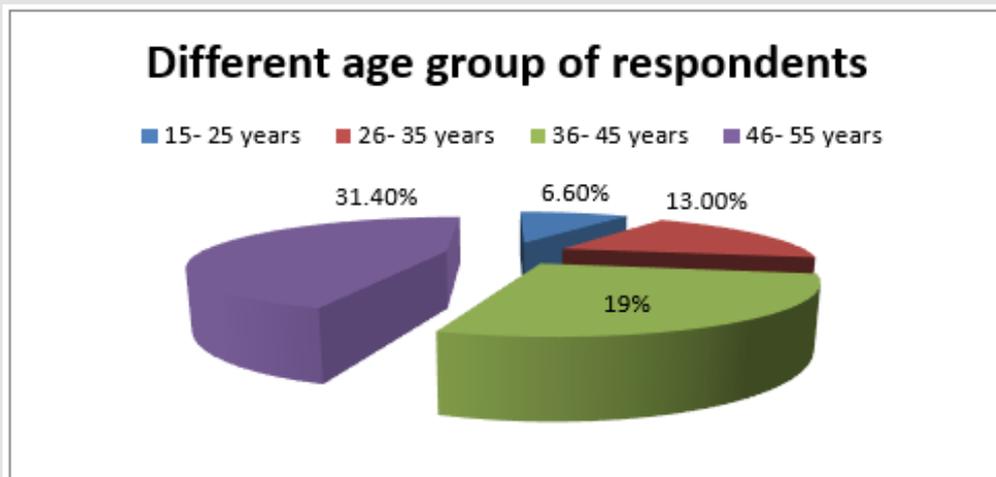


Figure 1: percentages of different age group of respondents.

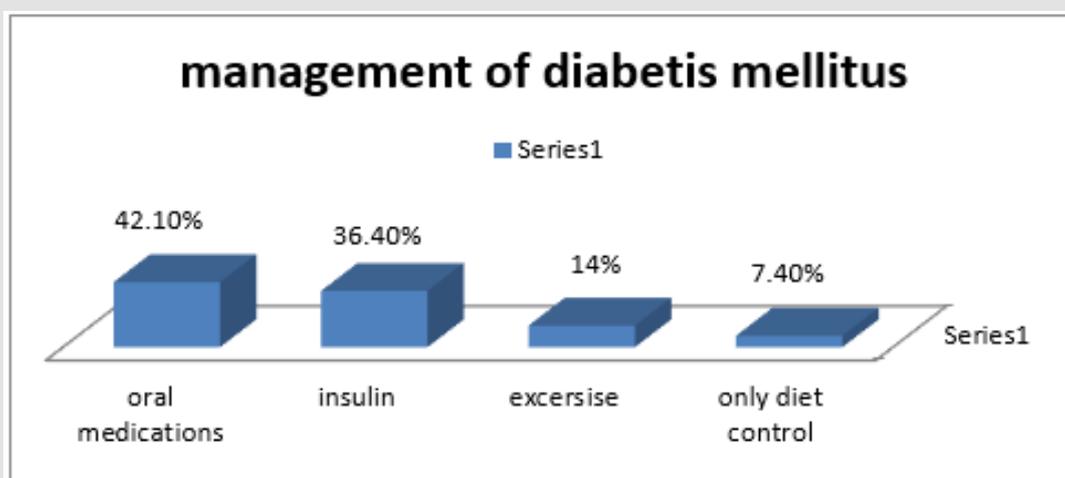


Figure 2: Management of diabetic by different practices.

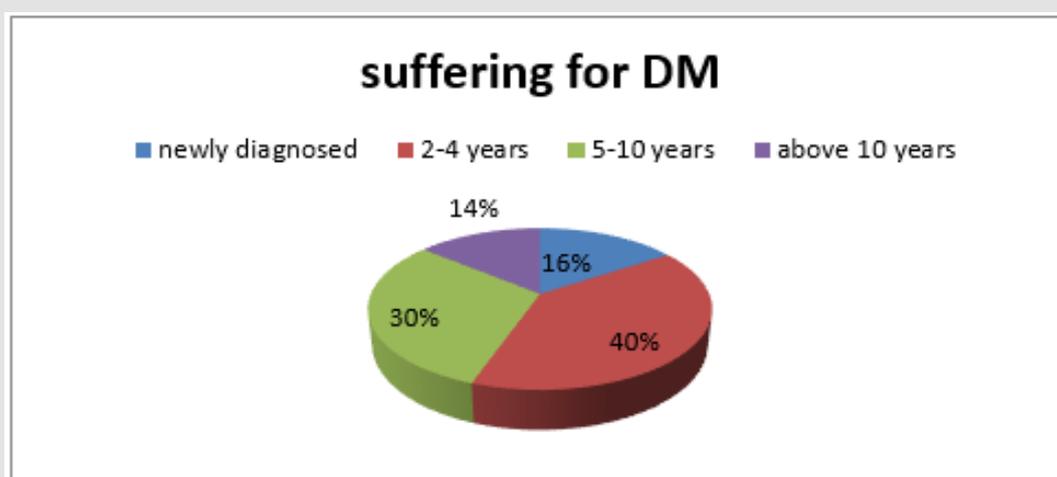


Figure 3: Respondents suffering from diabetic mellitus.

**Table 1:** Percentages of male and female among respondents.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	60	49.6	49.6	49.6
	Female	61	50.4	50.4	100
	Total	121	100	100	

**Table 2:** Types of diabetic mellitus among the respondents.

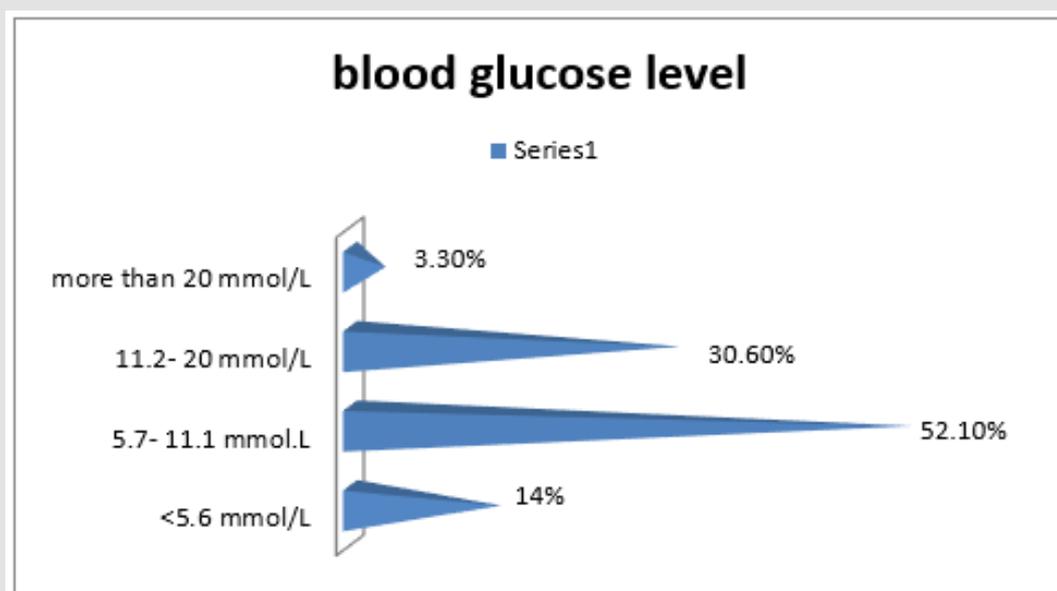
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	type 1	18	14.9	14.9	14.9
	type 2	99	81.8	81.8	96.7
	GDM	3	2.5	2.5	99.2
	other specific causes	1	0.8	0.8	100
	Total	121	100	100	

**Table 3:** Level of exercise among the patient.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mild	65	53.7	53.7	53.7
	moderate	43	35.5	35.5	89.3
	heavy	3	2.5	2.5	91.7
	no	10	8.3	8.3	100
	Total	121	100	100	

Among the respondent the highest percentage of them were not suffering from skin and soft tissue infection (73.6%), only 32(26.4 %) were sufferings from skin and soft tissue infection (Table 4). Among the respondent, the highest percentage previously had no skin infection (86.8%) and only 13.2% had skin infection (Table 5). Among the respondent the highest percentage of the respondents had blood sugar level about 5.7- 11.1 mmol/L 52.1%, 30.6% has 11.2- 20 mmol/L, 14 % has <5.6 mmol/L and 3.3 % had more than 20

mmol/L (Figure 4). Among the respondent the highest percentage of the respondents had uncontrolled blood sugar about 52.1 % and 47.9 %) had controlled blood sugar level. Among the respondent the highest percentage of them had fluctuated blood sugar level about (55.4 %) and 44.6 % had static blood sugar level. Fluctuated blood sugar (19.8%) occurs due to irregular oral medication, 19.8 % due to irregular oral medication, and 18.2 % due to uncontrolled diet and 9.9 % due to inadequate physical exercise (Table 6).



**Figure 4:** Level of blood sugar among the patients.

**Table 4:** Respondents suffering from skin and soft tissue infection.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	32	26.4	26.4	26.4
	no	89	73.6	73.6	100
	Total	121	100	100	

**Table 5:** Presence of skin infection among the respondents.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	16	13.2	13.2	13.2
	no	105	86.8	86.8	100
	Total	121	100	100	

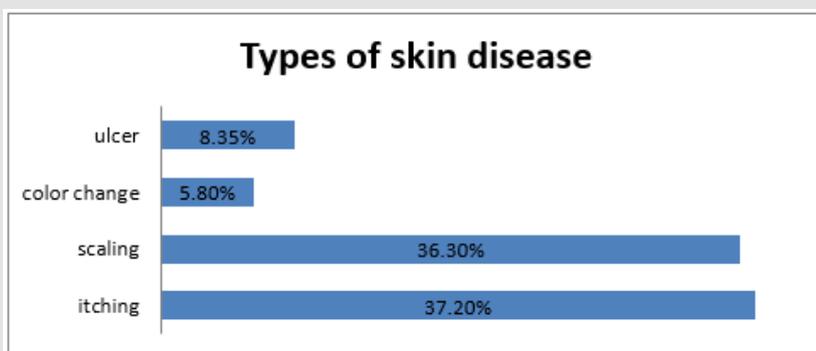
**Table 6:** Probable cause of fluctuation of diabetes mellitus.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	due to irregular oral medication	24	19.8	19.8	19.8
	irregular insulin	22	18.2	18.2	38
	uncontrolled diet	24	19.8	19.8	57.9
	inadequate physical exercise	12	9.9	9.9	67.8
	skip question	39	32.2	32.2	100
Total		121	100	100	

Among the respondent the highest percentage of the respondents has knowledge about skin disease (62%) and 38% has no knowledge. Among the respondent the highest percentage of the respondents had itching about (37.2%), and 36.4% had scaling, 8.35% had sulcer, and 5.8% had skin color change (Figure 5). Among the respondent the highest percentage of the respondents are visit to physician regularly about 52.9 5, 29.8 % visit irregularly to physician and 17.4 5 do not visit to physician (Figure 6). The highest percentage of the respondents has skin disease for <15 days about 30.6%, 10.7 % for 1 month- 6 months,9.1% for 6- 30 days and 8.3% for more than 6 months.41.3% skip this question because they had no skin disease (Figure 7). The highest percentage of the respondents taking anti-fungal 37.3%, 17.4% taking antibacterial,

8% antiparasitic and 1.7 % antivirals. And 43 % patients skip this question because they have no skin disease (Figure 8). The highest percentage of the respondents took local medication about 35.5%, 19% took systemic medicine and 5.8 took both systemic and local medicine. 39.7 % skip this question because they have no skin disease (Figure 9). Among the respondent the highest percentage had no infection (40%), 23% had eye disease, 14 % kidney disease, 9 % UTI, 7% respiratory infection and 7 % had oral infection (Figure 10).

The above Table 7 shows that there is no significant relationship between types of diabetic mellitus and skin infection. monthly income of the family and parents wish to send to the school,  $\chi^2(1, N=121) = 3.608, p = .729$ .



**Figure 5:** Types of skin diseases among the respondents.

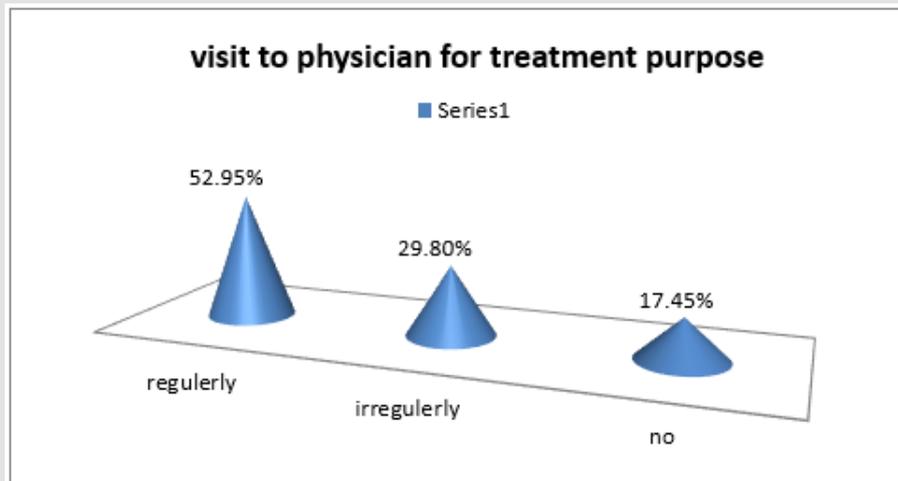


Figure 6: Visit to physician for treatment purpose.

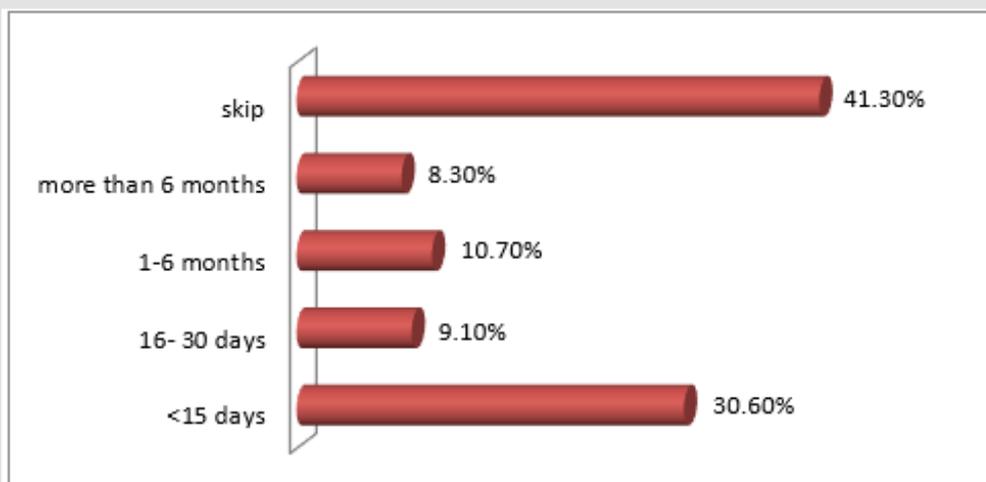


Figure 7: How long the respondents are disease suffering for skin.

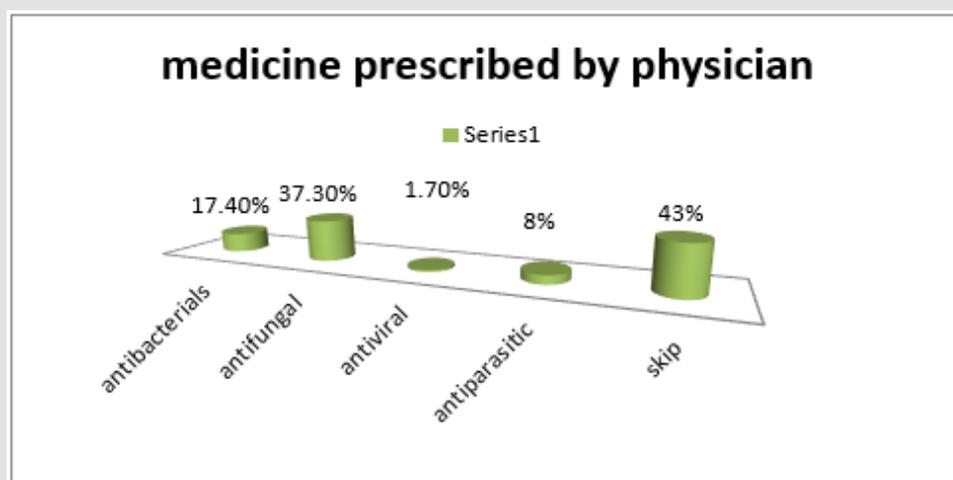


Figure 8: Medicine prescribe by physician to the respondents.

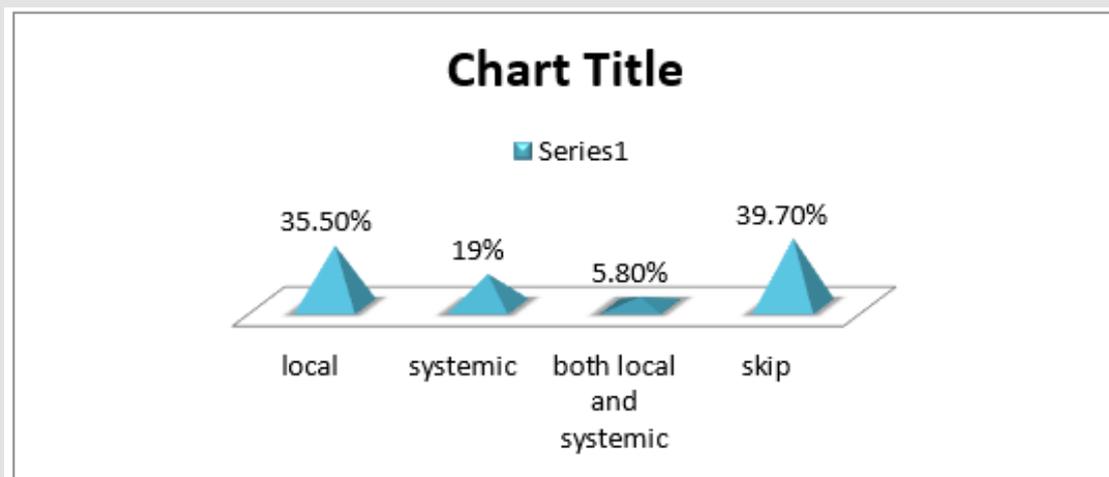


Figure 9: Medicine prescribe by physician to the respondents.

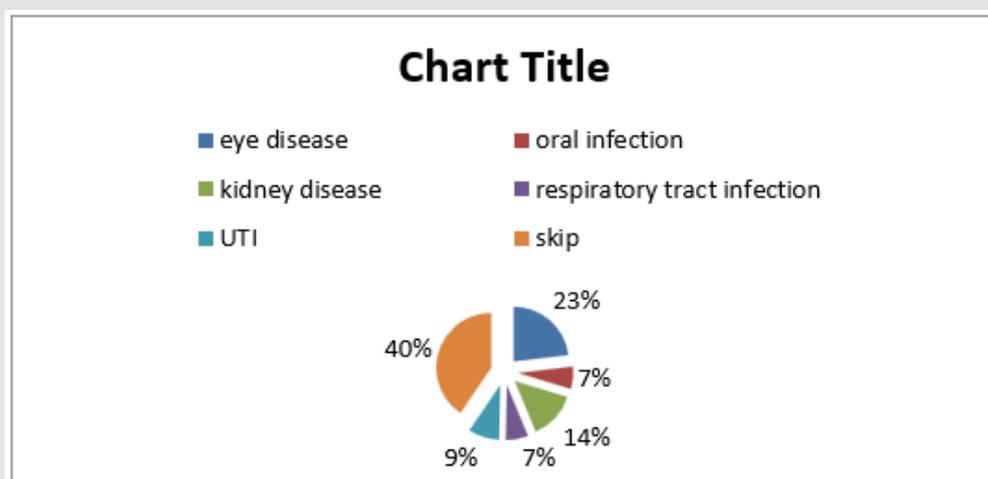


Figure 10: Type of soft tissue infection the patient suffers.

Chi-Square Tests.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.608a	6	0.729
Likelihood Ratio	3.349	6	0.764
Linear-by-Linear Association	0.791	1	0.374
N of Valid Cases	121		

Table 7: Association between types of diabetic mellitus and skin infection.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Types of diabetic mellitus * types of soft tissue infection	72	59.50%	49	40.50%	121	100.00%

Note: The above table shows that there is no significant relationship between level of diabetic mellitus and soft tissue infection,  $\chi^2(1, N=121) = 13.709, p = .320$ .

### Chi-Square Tests.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.292a	9	0.011
Likelihood Ratio	19.885	9	0.019
Linear-by-Linear Association	9.643	1	0.002
N of Valid Cases	77		

Note: The above table shows that there is a significant relationship between level of diabetic mellitus and skin disease,  $\chi^2(1, N=121) = 21.292, p = .011$ .

### Discussions

It is an important question that the diagnosis is very important for treatment of diabetes mellitus. The exact diagnosis is needed to treat the disease. If it is diagnosed, then the treatment protocol is difference. Among the respondent the highest percentage of the respondent's sufferings from type- 2 diabetic mellitus about 99(81.8 %), 18 (14.9 %) sufferings from type- 1 diabetic mellitus and rest 1 % sufferings from other specific causes. The invasive bacterial infections like Group B streptococcus have also been associated with DM. Some studies record Group B streptococcal disease in number of pregnant adults [22,23]. Skin, soft tissue and bone (cellulites, foot ulcers and decubitus ulcers) are the frequently infected areas in Group B streptococcus infection.

The risk of Group B streptococcal infections was found to be increased with age [24]. Staphylococcus aureus is a major pathogen implicated in diabetic foot infections [9,25]. Staphylococcal folliculitis or skin abscesses are counted as the most common bacterial infections in uncontrolled diabetes (Klingelhoets et al. 2015) [26,27]. Acute and Invasive ("malignant") otitis externa is a quite rare but potentially fatal infection of the external auditory canal and skull. It mainly involves inflammation of the ear canal [28]. Pseudomonas aeruginosa is the causative organism in the vast majority of cases. The acute form is caused primarily by P. aeruginosa and S. aureus. Acute otitis externa manifests with Unrelenting pain and rapid onset of ear canal inflammation, resulting in otalgia, itching, canal edema, canal erythema, and otorrhea.

The perineum, trunk, abdomen and upper extremities are most commonly involved in Necrotizing fasciitis [13,29,30]. In soft-tissue infections, foot infections are the most common soft tissue infections in patients with diabetes [14]. In diabetic individuals, mycotic infections might elevate the risk of manifesting diabetic foot syndrome [19]. Moreover, Glossitis, Paronychia, and onychomycosis are quite frequent [17,31-33]. In the present study, the highest percentage of the respondents had itching about 37.2%, 36.4% has no skin disease, 12.4% has skin ulcer, 8.35 has scaling and 5.8% has color change. Among the respondent the highest percentage of the respondents taking anti-fungal 37.3%, 17.4% taking antibacterial, 8% antiparasitic and 1.7 % antivirals.

It is very important for diabetes mellitus that patient should have fare knowledge about diabetes mellitus. This knowledge is very helpful for prevention as well as self-control of disease. Among the respondent the highest percentage of the respondents had knowledge about diabetic mellitus 118 (97.5%) and rest 3(2.5 %) has no knowledge about diabetic mellitus. Among the respondent the highest percentage of the respondents heard about diabetic mellitus from physician about 63.6 %, 19.8% from local doctor, 9.9% from health worker and 6.6 % from any communication media. Among the respondent the highest percentage of the respondents live in nuclear family about 70.2%, 27.3 % lives in joint family and rest 2.5 % lives in extended family.

It is an important question that the diagnosis is very important for treatment of diabetes mellitus. The exact diagnosis is needed to treat the disease. If it is diagnosed, then the treatment protocol is difference. Among the respondent the highest percentage of the respondent's sufferings from type- 2 diabetic mellitus about 99(81.8 %), 18 (14.9 %) sufferings from type- 1 diabetic mellitus and rest 1 % sufferings from other specific causes.

### Conclusion

Diabetes mellitus is one of the chronic deadly diseases worldwide. The complication of this disease is mainly the burden. Skin and soft tissue infection is most common complication of this disease [34-36]. Diabetic patient is more prone to infection by various organisms such as fungus bacteria, virus, parasite etc. The study reveals that, within 121 respondents, most of the diabetic patients had skin and soft tissue infection and the patients who had uncontrolled blood glucose level they were frequently experienced of this complication [37]. The lack of knowledge and also unhealthy practices are also a cause of skin and soft tissue infection among diabetic patients. Skin disease is more frequently occur among the patients whose blood glucose level was chronic and uncontrolled [38]. The prevalence of diabetic mellitus is increasing day by day and is the second cause of death worldwide. Due to its complications, the condition will be more dangerous if we cannot prevent the DM as well as control of blood sugar level of patients. That may cause various types of health complications and threatened our life [39-43].

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## Ethical Consideration

Formal approval was obtained from concerned authority of Faridpur Diabetic Association Medical College Hospital, Faridpur.

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