RESEARCH ARTICLE

Assessment of biochemical changes in patients with type 2 diabetes mellitus along with urinary tract infection and their management on quality of life

N. Soundarya, P. Rajasekar*

ABSTRACT

Objectives: Diabetes mellitus is a major endocrine disorder that affects the quality of life. The severity of the impact often depends on the presence of urinary tract infections (UTIs) in most patients with type 2 diabetes mellitus. It disrupts the physiological functioning of patients and also reduces their quality of life. *Materials and Methods*: The present study is designed to evaluate the biochemical changes in patients with diabetes, UTI, and diabetes with UTI. The study also evaluates the quality of life of these patients. The study included four groups of subjects: normal, diabetic, UTI, and diabetes with UTI, with 30 subjects in each group. Levels of hemoglobin, glucose, protein, urea, and creatinine were measured. Quality of life management was assessed using the Quality of Life (QOL) Index—Diabetes III Version. *Results*: The biochemical analysis showed a significant decrease in total protein, hemoglobin, and blood sugar levels in patients with diabetes and UTI compared to those without. A comparative study of the QOL Index revealed that health and functioning in daily life, socioeconomic status, psychological status, and family support are crucial for maintaining the QOL of individuals with diabetes, UTI, and both conditions combined, compared to those without these conditions. *Conclusion*: The overall results proved that the severity of diabetes and UTI is related to their quality of life.

Keywords: Diabetes, urea, blood sugar, total protein, Quality of life.

Indian Journal of Physiology and Allied Sciences (2025); DOI: 10.55184/ijpas.v77i04.500 **ISSN:** 0367-8350 (Print)

INTRODUCTION

Diabetes Mellitus (DM) is an endocrinological disorder characterized by increased blood sugar levels, which is more prevalent in the modern world, leading to decreased lifespan due to diabetes-induced microvascular and macrovascular complications[1]. Other complications are retinopathy, neuropathy, nephropathy, the occurrence of urinary tract infections and disruption of the urinary system, discomfort in urination, impairment of the kidney, asymptomatic bacteriuria, acute pyelonephritis[2], fatality due to severe UTI, and overall reduction in the quality of life (QOL) of people with DM[2]. DM is highly related to severe urologic complications such as dysfunction of the bladder and sexual organs, and infections in the urinary tract region. UTI is the most common disease affecting all age groups and genders and is caused by damage to the kidney tissues[3]. UTI is caused by microbial infection in the organs of the urinary system, such as the kidney, pelvis, ureter, bladder, urethra, and adjacent organs. There are two types of UTI such as symptomatic UTI and asymptomatic UTI. The prevalence of UTI in patients with diabetes mellitus produces a significant burden on the economy of the world in terms of healthcare costs [4]. There are various reasons for UTI in DM patients, among which hyperglycemia is the major contributor to microbial infection. Lack of awareness, poor glycemic control, and unhygienic conditions may contribute to the severity of UTI-related complications in diabetic patients. Diabetes is a major chronic disease affecting various components of life, and the number of DM cases has increased from 170 to 370 million.

Department of Zoology, Jamal Mohamed College (Autonomous), Tiruchirappalli- 620020, Tamil Nadu, India.

***Corresponding author:** P. Rajasekar, Department of Zoology, Jamal Mohamed College (Autonomous), Tiruchirappalli- 620020, Tamil Nadu, India, Email: rajasekar275@gmail.com

How to cite this article: Soundarya N, Rajasekar P. Assessment of biochemical changes in patients with type 2 diabetes mellitus along with urinary tract infection and their management on quality of life. *Indian J Physiol Allied Sci* 2025;77(4):33-37.

Conflict of interest: None

Submitted: 08/11/2025 **Accepted:** 20/11/2025 **Published:** 26/11/2025

A person's quality of life (QOL) is based on physical, mental, emotional, and social status. The diabetic patient faces more stress in terms of treating themselves than a healthy person. Ramya *et al.* [5] stated that as an illness of lifestyle, diabetes affects all areas of life of diabetic patients. Knowledge about diabetes, stress due to diabetes, and the personality of diabetic people may affect their quality of life. UTIs have a significant relationship with the QOL of diabetic patients. So, patients must be informed about the disease condition and how to manage the disease state to prevent the severity of the complications caused by diabetes. Gregg *et al.* [6] reported that physical disability of adults with diabetes may directly affect their quality of life. So, there is a need for health education and changes in the patient's behavior to overcome the associated problems.

Regarding the literature review, this study is focused on analyzing biochemical changes in patients with diabetes, UTI, and diabetes with UTI. Physiological factors like age,

gender, diet, and regular exercise were examined, as were biochemical changes such as blood glucose, hemoglobin, total protein, urea, creatinine, and electrolyte content. Comparative analyses on the management of QOL of patients with diabetes, UTI, and diabetes with UTI were conducted.

MATERIALS AND METHODS

The study was conducted in a private hospital. With permission from the Institutional Ethics Committee, the consenting subjects were approached for participation in this study. Total

Study design

The study group was divided into four groups: healthy controls, patients with diabetes mellitus type 2 (DMT2), patients with UTI, and patients with DMT2 and UTI. In each group, 30 samples, totaling 120 respondents, were selected using the purposive sampling method. The study population comprises individuals aged over 18 years of both genders. Participants without diabetes and urinary tract infection (UTI) were designated as controls. The study includes patients with DMT2, UTI, and those with both DMT2 and UTI. Patients in the ward and those who have undergone surgery were not included. Pregnant women with urinary tract infections (UTI) were excluded from the study. Patients who were not interested were also excluded.

Data collection

The data were collected from the outpatients in the private hospitals in Tiruchirappalli, Tamil Nadu. With the proper approval from the management of the hospital, patients fulfilling the inclusion criteria were selected after receiving written informed consent. A complete personal profile of the study group was obtained using the primary data collection method, and the biochemical results were collected from the sample group using the secondary data collection method.

Biochemical analysis

The GOD-POD method analyzed the patient's post-prandial serum glucose level. [7] The total protein content of the serum was estimated by the Biuret method [8], the hemoglobin level was estimated by the cyanmethemoglobin method [9], the urea level was estimated by the Berthelot method[10], and the creatinine content of the serum was estimated by the Jaffe method.[11]

Data Collection on Quality of Life Management:

From the selected respondents, quality of life management is assessed using the QOL Index – Diabetes III Version. [12] The QOL Index includes 34 questions covering five dimensions: health status and functioning, socio/economic status, psycho-spiritual status, family and friends support, and overall QOL. Respondents were instructed to rate the statements using a 5-point scale. Finally, for each scale's scoring system, the total score is collected and analyzed for its statistical significance.

Statistical analyses

The data collected was statistically analyzed using the Statistical software package SPSS (version 17.0). The significant difference among the study groups was analyzed using a one-way ANOVA test at a 95% confidence interval.

RESULTS

The study results show that among the 120 respondents, most (35%) are 50-60 years old. The study includes 67 female and 53 male respondents. Among 120 respondents, 56.7% belong to a nuclear family, while 43.3% live in a joint family. Among the study group respondents, 16.7% prefer a vegetarian diet, 15% prefer a non-vegetarian diet, and 68.3% prefer a mixed diet (Table 1).

The mean and SD levels of the serum glucose, hemoglobin, total protein, urea, and creatinine levels of the study group are presented in Table 2. The level of serum glucose, hemoglobin, and total protein was comparatively higher in patients with diabetes than in other groups. The results of a one-way analysis of variance showed that the F values for serum glucose were 37.15, hemoglobin was 3.23, and total protein level was 4.82. There is a significant ($P<0.05$) difference in the levels of glucose, hemoglobin, and total protein among the study group. There is no significant ($P>0.05$) difference in the level of urea and creatinine among the study group.

The data on QOL (Table 3) proved that there is a significant difference ($P<0.05$) in the dimensions of QOL, such as health status and functioning (F value-2.818), socio/economic condition (F value-2.7), psycho/ spiritual condition (F value-3.6), support from family (F value-6.9), friends, and total QOL (F value-3.68). Patients with diabetes and UTI have differences in the health and functioning aspects of daily life. Compared to controlling people's socioeconomic status, psychological/spiritual status plays a major role in maintaining the QOL of patients with UTI and diabetes+UTI. Patients with diabetes and UTI receive less family support in the control and maintenance of the disease. Their overall

Table 1: Demographic details of the respondents in the study group

Variables	*Numbers (Total 120)*	*Percentage (%)*
Gender		
Male	53	44.2
Female	67	55.8
Age (yrs)		
30-40	30	25.0
40-50	26	21.7
50-60	42	35.0
60-70	14	11.7
Above 70	8	6.6
Family type		
Nuclear family	68	56.7
Joint family	52	43.3
Diet		
Vegetarian	20	16.7
Nonvegetarian	18	15.0
Mixed	82	68.3

Table 2: Mean and SD of the biochemical parameters of the experimental groups

Parameters (units)	*Experimental groups (Mean ± SD)*			
	Control	*Diabetes*	*Diabetes & UTI*	*UTI*
Serum glucose* (mg/dL)	109.4 ±13.5	202.9 ± 65.9	228.4 ± 77.6	127.5 ± 10.9
Hemoglobin* (g/dL)	11.2 ± 2.01	11.6 ± 1.3	12.4 ± 1.5	11.1 ± 1.9
Total protein* (g/dl)	7.1 ± 0.7	7.2 ± 0.6	6.6 ± 0.9	7.3 ± 0.8
Urea (mg/dL)	29.2 ± 10.4	33.8 ± 16.4	30.8 ± 13.7	30.6 ± 16.9
Creatinine (mg/dL)	1.1 ± 0.5	1.5 ± 1.1	1.3 ± 0.9	1.3 ± 0.9

Data are presented as Mean ± SD of 30 observations. * indicates $p < 0.05$.

results indicated that compared to the Control group, the QOL of the respondents is influenced by the severity of the disease condition.

DISCUSSION

Age of the diabetic patient is an essential factor that influences the onset and management of diabetes [13]. While considering age, DMT1 develops in the young age group, but DMT2 develops later in life. Physiological changes in older age, lifestyle changes, and socioeconomic status contribute to the challenges faced by patients with DMT2. Diabetic patients of older age were facing struggles in the maintenance of self-care, adherence to medication, and management of chronic diseases associated with diabetes (14, 15), which increases the need for support from others for their personal needs. In relation to the literature review, the present study showed that the age of the patients plays a crucial role in the maintenance of DMT2 and UTI.

Age and gender of the diabetic patients play a major role in the management of diabetes and UTI, and are important for the researchers and health professionals for the maintenance of health care, and help in policy making towards new intervention strategies to face the problems developed by diabetic patients in all the cultural groups [15,16]. According to literature, the gender of the patient influences the onset of diabetes, its associated factors, and the complications that develop after the occurrence of diabetes [17].

In relation to the results of the current study, Family setting plays a crucial role in diabetes management in terms of physical, mental, and financial support from the family members [18]. Various clinical studies show a correlation between social support and adherence to medical treatment among individuals with DMT2. Support from family members and friends provides adherence to therapy by encouraging self-esteem and reducing the depression caused by the illness.[19]. Another study by Rosland et al. (20) showed that social support is a barrier to self-care in patients with DMT2, decreasing adherence to diabetes treatment and healthcare. Diabetes is a chronic disease characterized by impaired carbohydrate metabolism, which is caused by improper diets and leads to abnormalities in glycemic control and changes in lipid content [21]. The results of Mędrela-Kuder [22] proved that patients with DMT2 fail to follow diet plans because they do not take regular meals, eat sweets and snacks between meals, and consume inappropriately cooked foods. DMT2 can be prevented by following a proper diet, which in turn controls blood glucose and lipid levels [23].

The results of Al-Ofairi et al. [24] indicated that the duration and glucose levels of DMT2 are important risk factors for UTI in DMT2 patients compared to non-diabetic individuals. A study in Romania [25] proved that 12% of 2,465 DMT2 patients were found with UTI, which is more in females with DMT2 than in males. A study conducted in America [26] stated that UTI is more prevalent in men and women with DMT2 among 89790 patients [27]. Patients with DMT2 show poor glycemic control as a stressed state of the body, causing increased blood glucose levels, leading to glycosuria, which favors microbial growth, leading to UTI in diabetic conditions [28].

Hemoglobin level is highly associated with diabetes condition, and anemia during diabetes may lead to renal problems.[29] Similarly, Hanoush *et al*. (3) demonstrated a decrease in hemoglobin levels in UTI patients compared to controls.

Table 3: Mean and SD level of the dimensions of QOL among the experimental groups

Dimensions of QOL	*Experimental groups (Mean ± SD)*			
	Control	*Diabetes*	*Diabetes & UTI*	*UTI*
Health and Functioning *	51.70 ± 9.30	46.63 ± 8.20	46.73 ± 8.00	50.77 ± 9.20
Socioeconomic status*	25.77 ± 4.70	25.43 ± 5.60	23.60 ± 2.50	23.33 ± 2.80
Psychological/spiritual status*	32.03 ± 5.60	29.30 ± 6.90	31.50 ± 5.70	27.63 ± 4.60
Family*	21.67 ± 3.80	18.23 ± 2.02	19.37 ± 4.70	18.23 ± 2.02
Overall QOL*	131.20 ± 15.70	119.60 ± 18.80	121.20 ± 11.10	119.97 ± 16.20

Data are presented as Mean ± SD of 30 observations. * indicates $p < 0.05$.

According to Dixon-Umo and Oti [30], above 80% of the UTI patients show proteinuria because of increased excretion of protein and albumin in the urine due to UTI. While other proteins replace the loss of albumin, this prevents a decrease in total protein and results in an insignificant difference in total protein content between UTI patients and the control sample [31].

Serum urea and creatinine levels are important biochemical parameters used in diagnosing renal failure, helping in treating renal diseases, adjusting drug dosages, and making decisions about kidney transplantation therapy [32]. A comparative study conducted by Alam et al. [33] between diabetic and non-diabetic adults showed an increase in serum urea levels. Severity and duration of diabetes are positively correlated with increased serum urea, creatinine, and in DMT2 patients with uncontrolled hyperglycemia, it leads to severe kidney damage [34, 35]. The results of Pathan et al. [35] showed that among 105 DMT2 patients, only 5 had increased urea, and 14 had increased serum creatinine. A similar pattern of increase in the level of serum urea and creatinine content is observed in the present study, which is not statistically significant.

In the present study, consistent with the literature reviewed, the onset and duration of diabetes, poor glycemic control leading to renal problems, retention of urea and creatinine, and hyperglycemia, proteinuria, glycosuria, and polyuria frequently result in UTI [36].

The changes in the lifestyle and behavior of humans in the last century resulted in the increased incidence of DMT2 worldwide. It is a metabolic disorder that is increasingly prevalent in society, leading to a decreased life span. At the same time, microvascular and macrovascular diseases contribute to a reduction in overall quality of life.[2] WHO[37] indicates that 90% of the world population is affected by DMT2. These patients were at greater risk for treatment, which also affected their QOL.[38],[39] The development of infection is more common in diabetes patients, and infection in the urinary tract is the most critical type of infection[40]. The results of Borj *et al.* [41] stated that age, gender of the patients, hyperglycemia, increased HbA1c, glycosuria, and albuminuria are the factors responsible for UTI in patients with diabetes. The different types of UTI developing in diabetic patients include cystitis, pyelonephritis, emphysematous pyelonephritis, and perinephric abscess[42]. Psychological well-being in the management of diabetes plays a significant role in increasing the QOL of diabetes patients and promotes their mental health. In relation to literature, the results of the present work proved that the clinical condition of patients with diabetes and UTI plays a significant role in maintaining psychological well-being, thus aiding in the management of quality of life.

CONFLICT OF INTEREST

There is no conflict of interest for this work.

REFERENCES

1. Ronald A, Ludwig E. Urinary tract infections in adults with diabetes. International Journal of Antimicrobial Agents. 2001;17(4):287–92. Available from: https://doi.org/10.1016/s0924-8579(00)00356-3.
2. Udayanath B, Ranjan D, Kumar S, Manasi T. Assessing urinary tract infections in diabetes mellitus patients: a comprehensive hospital-based study in Eastern India. International Journal of Academic Medicine and Pharmacy. 2023;5(6):65–9. Available from: http://dx.doi.org/10.47009/jamp.2023.5.6.15.
3. Hanoush NM, Abdulmageed LH, Nawaf SS, Al-Ani MQ. Study of Physiological and Biochemical Changes of Patients with Urinary Tract Infection in AL- Ramadi City. Journal of University of Anbar for Pure Science (JUAPS). 2024;18(01):23–28. DOI:10.37652/juaps.2023.143333.1137
4. Sarafidis PA, Ortiz, A. 2019. The risk for urinary tract infections with sodium-glucose cotransporter 2 inhibitors: No longer a cause of concern? Clinical Kidney Journal. 2019;13: 24–26. DOI: 10.1093/ckj/sfz170
5. Ramya MS, Prasanth CB, Subramanian C. Psychological Well-Being and Quality Of Life among Patients with Type 2 Diabetes Mellitus. Journal of Positive School Psychology. 2022;6(4): 243-256. PMID: 359453639.
6. Gregg EW, Beckles GL, Williamson DF, Leveille SG, Langlois JA, Engelgau MM, Narayan KM. Diabetes and physical disability among older US adults. Diabe care. 2000;23(9):1272-7. Available from: https://doi.org/10.2337/diacare.23.9.1272.
7. Trinder P. Enzymatic determination of glucose in blood serum. Annals of Clinical Biochemistry, 1969;6: 24. https://doi.org/10.1177/000456326900600108
8. Tietz NW. Text book of clinical chemistry. 3rd Ed. C.A.Burtis, E.R.Ashwood, W.B. Saunders. 1999;477-530. ISBN-13. 978-072165610.
9. Dacie JV, Lewis SM. Practical hematology 10th edition Edinburgh: Churchill Livingstone, 2006;25-57. ISBN: 9780702031977.
10. Chaney AL, Marbach EP. Modified reagents for determination of urea and ammonia. Clinical Chemistry. 1962;8:130-132. ISSN/ISBN: 0009-9147/PMID: 13878063.
11. Burtis CA, Ashwood ER, Bruns DE. Tietz textbook of clinical chemistry and molecular diagnostics (4th ed.), Elsevier Saunders. Paris, 2006. ISBN 0-7216-0189-8.
12. Ferrans C, Powers M. Quality of life index: Development and psychometric properties. Advances in Nursing Science. 1985; 8(1):15–24. Available from http://dx.doi.org/10.1097/00012272-198510000-00005.
13. Lama L, Wilhelmsson O, Norlander E, Gustafsson L, Lager A, Tynelius P, et al. Machine learning for prediction of diabetes risk in middle-aged Swedish people. Heliyon. 2021; 7(7): e07419, DOI: 10.1016/j.heliyon.2021.e07419.
14. Tian Y, Li C, Shilko TA, Sosunovsky VS, Zhang Y. The relationship between physical activity and diabetes in middle-aged and elderly people. Medicine. 2023;102(6):e32796, DOI:10.1097/md.0000000000032796.
15. Jain R, Tripathi NK, Pant M, Anutariya C, Silpasuwanchai C. Investigating Gender and Age Variability in Diabetes Prediction: A Multi-Model Ensemble Learning Approach. IEEE Access. 2024;12:71535-71554. DOI: 10.1109/ACCESS.2024.3402350.
16. Issaka A, Cameron AJ, Paradies Y, Bosu WK, Houehanou YCN, Kiwallo JB, et al. Effect of age and sex on the associations between potential modifiable risk factors and both type 2 diabetes and impaired fasting glycaemia among west African adults. BMC Public Health. 2022; 22(1):1–12. DOI: 10.1186/s12889-022-13588-w.

17. Deischinger C, Dervic E, Leutner M, Kosi-Trebotic L, Klimek P, Kautzk A, et al. Diabetes mellitus is associated with a higher risk for major depressive disorder in women than in men. BMJ Open Diabetes Research & Care. 2020; 8(1):e001430. DOI:10.1136/bmjdrc-2020-001430.
18. Bedard M, Gibbons C, Lambert-Belanger A, Riendeau J. Development of a tool to investigate caregiving issues from the perspective of family physicians and discussion of preliminary results. Primary health care research & development. 2014;15(2):220-226. DOI:10.1017/S146342361300046.
19. Miller TA, DiMatteo MR. Importance of family/social support and impact on adherence to diabetic therapy. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2013;6:421–426. http://dx.doi.org/10.2147/DMSO.S36368.
20. Rosland AM, Kieffer E, Israel B, et al. When is social support important? The association of family support and professional support with specific diabetes self-management behaviors. Journal of general internal medicine. 2008;23:1992–1999. DOI: 10.1007/s11606-008-0814-7. PMID: 18855075
21. Sami W, Ansari T, Butt NS, Hamid MRA. Effect of diet on type 2 diabetes mellitus: A review. International journal of health sciences. 2017;11(2):65-71. PMID: 28539866; PMCID: PMC5426415.
22. Mędrela-Kuder E. Proper diet in type 2 diabetes as a means of patients rehabilitation. Roczniki Panstwowego Zakladu Higieny. 2011;62(2):219-223 (in Polish). PMID: 21980871
23. Gajda K, Sulich A, Hamułka J, Białkowska A. Comparing diabetic with non-diabetic overweight subjects through assessing dietary intakes and key parameters of blood biochemistry and haematology. Roczniki Panstwowego Zakladu Higieny. 2014;65(2):133-8. PMID: 25272580.
24. Al-Ofairi BA, Al-Ganady AS, Brooq EM, Al-Duois TH, Howerth ZA, Mokaram SA,et al. The Outcome of Urinary Tract Infections among Diabetes Mellitus Patients in Ibb City, Yemen. PSM Biological Research. 2018;3(2):61-69. ISSN: 2517-9586.
25. Chita T, Timar B, Muntean D, Baditoiu L, Horhat F, Hogea E, et al. Urinary tract infections in Romanian patients with diabetes: prevalence, etiology, and risk factors. Therapeutics and clinical risk management. 2016;16(13):1-7. doi: 10.2147/TCRM.S123226. PMID: 28031715; PMCID: PMC5179217.
26. Fu AZ, Iglay K, Qiu Y, Engel S, Shankar R, Brodovicz K. Risk characterization for urinary tract infections in subjects with newly diagnosed type 2 diabetes. Journal of diabetes and its complications. 2014;28(6):805-810. doi:10.1016/j.jdiacomp.2014.06.009.
27. Mitache MM, Curutiu C, Rusu E, Bahna R, Ditu M, Moldovan H, et al. Urinary Tract Infections in Patients with Type 1 and Type 2 Diabetes: Etiology, Resistance to Antibacterial Chemicals and Virulence Features. Revista de Chimie. 2017; 6(3): 566-569. Available from: http://www.revistadechimie.ro.
28. Wang X, Wang Y, Luo L, Tan L, Cai W, Chen L, Ren W. Prevalence and Associated Factors of Urinary Tract Infection in Patients with Diabetic Neuropathy: A Hospital-Based Cross-Sectional Study. Diabetes, metabolic syndrome and obesity: targets and therapy. 2023;16:1261–1270. Available from: https://doi.org/10.2147/DMSO.S402156 .
29. Kwon E, Ahn C. Low hemoglobin concentration is associated with several diabetic profiles. The Korean journal of internal medicine. 2012;27(3):273-274. doi:10.3904/kjim.2012.27.3.273
30. Dixon-Umo RI, Oti IE. Urinary Tract Infection in Infants and Pre-school Children at a Tertiary Hospital in Uyo, Nigeria: The Prevalence, Clinical and Bacteriological Profiles. ACTA SCIENTIFIC PAEDIATRICS 3.9. 2020;2–9. ISSN: 2581-883X.
31. Egbeonu N, Ikaraoha C I, Johnkennedy N Assessment of Certain Serum Proteins, pH and C Reactive Protein in Patients with Urinary Tract Infections in Owerri, Journal of Clinical Research Notes. 2025;6(3): DOI:10.31579/2690-8816/167.
32. Baxmann AC, Ahmed MS, Marques NC, Menon VB, Pereira AB, et al. Influence of Muscle Mass and Physical Activity on Serum and Urinary Creatinine and Serum Cystatin C. Clinical journal of the American Society of Nephrology. 2008;3(2):348–354. doi:10.2215/cjn.02870707.
33. Alam J, Chandra SM, Mokarrama MN, Hoque M, Hasan M, Islam S, et al. A comparative analysis of biochemical and hematological parameters in diabetic and non-diabetic adults. Advanced Medical Sciences: An International Journal. 2015;2(1):1-9. Available from: https://api.semanticscholar.org/CorpusID:74034485.
34. Bamanikar SA, Bamanikar AA, Arora A. Study of Serum urea and Creatinine in Diabetic and non-diabetic patients in in a tertiary teaching hospital. The Journal of Medical Research. 2016;2(1):12-15. DOI:10.31254/jmr.2016.2104.
35. Pathan SB, Jawade P, Lalla P. Correlation of Serum Urea and Serum Creatinine in Diabetics *patients and normal individuals. International Journal of Clinical Biochemistry and Research*. 2020;7(1):45-48. Available from:https://doi.org/10.18231/j.ijcbr.2020.009.
36. Burekovic A, Haskovic E, Faruk C, Dzenana H. Correlation Between Inflammatory and Biochemical Parameters in Patients with Diabetes and Urinary Tract Infection. Materia Socio- medica. 2021;33(4):240-243. DOI: 10.5455/msm.2021.33.240-243.
37. World Health Organization. 10 facts on diabetes (EB/OL). Available from: http://www.who.int/features/factfiles/diabetes/en/ April 2016.
38. Polonsky WH. Emotional and quality-of-life aspects of diabetes management. Current Diabetes Reports. 2002;2(2):153–159. DOI10.1007/s11892-002-0075-5.
39. Schram MT, Baan CA, Pouwer F. Depression and quality of life in patients with diabetes: a systematic review from the European depression in diabetes (EDID) research consortium. Current Diabetes Review. 2009;5(2):112–119. DOI: 10.2174/157339909788166828 .
40. Nicolle LE. Asymptomatic bacteriuria in diabetic women. Diabetes care. 2000; 23(6):722–23**.** DOI: 10.2337/diacare.23.6.722
41. Rohani Borj M, Taghizadehborojeni S, Shokati A, Sanikhani N, Pourghadamyari H, Mohammadi A, Abbariki E, Golmohammadi T, Mojtaba Hoseiniharouni S. Urinary Tract Infection Among Diabetic Patients With Regard To The Risk Factors, Causative Organisms And Their Antimicrobial Susceptibility Profiles: Life Science - Microbiology. International Journal of Life Science and Pharma Research. 2017;7(3):L38-L47. Available from: https://www.ijlpr.com/index.php/journal/article/view/831.
42. Boyko EJ, Lipsky BA. Infection and diabetes. Diabetes in America. 1995;2:485-499. Available from: https://www.niddk.nih.gov/about-niddk/strategic-plans-reports/diabetes-in-america-2nd-edition.

PEER-REVIEWED CERTIFICATION

During the review of this manuscript, a double-blind peer-review policy has been followed. The author(s) of this manuscript received review comments from a minimum of two peer-reviewers. Author(s) submitted revised manuscript as per the comments of the assigned reviewers. On the basis of revision(s) done by the author(s) and compliance to the Reviewers' comments on the manuscript, Editor(s) has approved the revised manuscript for final publication.