JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2023, VOL 6, NO 4

The Impact of pharmacists consultations on patients with high blood pressure and diabetes mellitus; a systematic review

Ahmed Abdulaziz Alghamdi[1], Nawaf Ahmed sindi[2],Feras Faihan Albaqami[3] ,Ahmed Mohammed Algethami[4] ,Abdullah marzouq algethami[5] ,Turki Musaad alsufyani[6] ,Ebtsam abdullah ALthagafi[7] ,Naif Awad Althubiti[8] ,Hatim Ebrahim Alqurashi[9] ,Soltan Aodalah Mohamd Aljoed[10]

1 Pharmacist Department of Pharmacy King Abdulaziz Hospital-Makkah Saudi Arabia
2 Pharmacist Department of Pharmacy King Faisal Hospital-Makkah Saudi Arabia
3 Pharmacist Department of Pharmacy King Faisal Hospital-Makkah Saudi Arabia
4 Pharmacist Department of Medical Supply Al-Mahani General Hospital Al-Mahani Saudi Arabia
5 pharmacy technician Department of Pharmacy King Faisal Hospital-Taif Saudi Arabia
6 pharmacy technician Department of Pharmacy King Faisal Hospital-Taif Saudi Arabia
7 pharmacy technician Department of Pharmacy King Faisal Hospital-Taif Saudi Arabia
8 pharmacy technician Department of Pharmacy King Faisal Hospital-Taif Saudi Arabia
9 Pharmacist Assistant King Faisal Hospital-Makkah Saudi Arabia
10 Pharmacist Assistant King Faisal Medical complex-Taif Saudi Arabia

ABSTRACT
good management, medicine adherence, and changes in lifestyle lead to control of diabetes and hyper- tension. Counseling patients is an approach to the management of hypertension and diabetes. Pharmacists' counseling can assist patients in understanding their medications, coping with the barriers of the treatment plans, and receiving emotional support. This study aimed to assess the impact of counseling by pharmacists on hypertensive and diabetic patients by reviewing the previous studies that assessed this subject. Online data- bases, including PubMed, Science Direct, Google Scholar, Elsevier, Scopus, and Springer, were searched for eligible articles between the years 2018 and 2024. The terms including "Pharmacists, Counselling, Outcomes, Diabetes mellitus, Diabetic, Hypertension, Hypertensive, Patients, HbA1C, SBP, and DBP" were used for the search process. The included original English articles reporting counseling of diabetic/and/or hypertensive patients by pharmacists. A total of eight articles met the inclusion criteria and were involved in this review. The total number of patients was 1,390; there were three studies that assessed counseling impact on T2DM patients, three studies conducted on hypertensive patients, and two studies conducted on patients with both diseases. Counseling diabetic and/or hypertensive patients by pharmacists resulted in potential improvement in the outcomes of diabetes and hypertension, improvement in body mass index, lipid profile, adherence to medication, knowledge, attitude, and practice, as well as health-related quality of life. Therefore, pharmacists have an important role in controlling diabetes and hypertension and improving patients' outcomes.
Keywords: Effects, impacts, counseling, pharmacists, diabetic patients, hypertensive patients.

Introduction

High blood pressure is a condition that involves a blood pressure(BP) measurement that is consistently elevated in two ormore accurately measured BP readings on each of twoor more assessments [1]. Hypertension is a global healthissue with a global burden; the prevalence of hypertensionpersists to increase annually, and it is estimated thathypertension prevalence will affect 1.15 billion or 29% of the global population in 2025 [2]. Hypertension is more probably to occur among ethnic minority groups of Africandescent rather than whites in developing countries [1,3]. The prevalence of hypertension among African and WhiteAmericans is 45.2% and 29.1%, respectively[4]. Thechangein lifestyle, including shifting to sedentary life, increases themorbidity and mortality related to hypertension [5].
Type 2 diabetes mellitus (T2DM) is a chronic illnessthat is characterized by elevated levels of blood sugar. Proper management of T2DM is required to avoid several consequences and complications, such as complications of the heart, nerves, kidneys, and eyes [6]. In addition, complications of

diabetes can adverselyimpact the quality of life (QOL) of the patients [7].Studies confirmed that reducing the complications ofdiabetes can be established by proper control of blood glucose [8,9].
Counseling of patients is one approach for the managementof T2DM patients and reducing the risk of cardiovasculardisease, including hypertension [3,6]. Counseling is a process of assistance provided to patients who face health issues by an expert known as a mentor or counselor. The objective of counseling is to assist individuals or patients in resolving their issues and achieving optimal personal progression [6]. Counseling can educate patients about the importance of healthy lifestyle alterations such as regular exercise and a balanced diet [10].
Controlling diabetes is dependent on the adherence of patients to their medication, modification of lifestyle, andfrequent monitoring of blood sugar. Such actions can beaffected by proper education and counseling of the patient[11]. Similar to T2DM, hypertension can be managed appropriately through counseling on lifestyle and among some patients with a combination of medications. Therefore, hypertensive patients need counseling [12]. Counseling patients by pharmacists can assist patients in understanding their medications, coping with the barriersof the treatment plans, and receiving emotional support. Itwas stated that pharmacist counseling has been identifiedas a considerably effective strategy in the management ofT2DM [6]. Hence, this systematic review was performedto identify the impact of pharmacists' counseling diabeticand hypertensive patients.

Subjects and Methods

Search strategy

Adoption of the PRISMA checklist guidance for systematic review [13] was guaranteed. Exploration of online databases was carried out to obtain studies relatedto the current study subject. Such databases included PubMed, Science Direct, Google Scholar, Elsevier, Scopus, and Springer. The search process was restricted to the articles published in the year 2018 and until now in 2024. Different terms were used for the search process as keywords, which were used in different combinations, including "Pharmacists, Counselling, Outcomes, Diabetes mellitus, Diabetic, Hypertension, Hypertensive, Patients, HbA1C, SBP, and DBP." All the obtained titleswere revised thoroughly.

Eligibility criteria

The findings were then examined to exclude duplicate articles, articles published before the year 2018, andthose reporting counseling by other personnel and did not focus on pharmacists only. Also, studies that reported counseling by pharmacists to patients with other diseases were excluded. In addition, the studies reported counseling of diabetic and/or hypertensive patients with other complications or chronic diseaseswere excluded. Therefore, all the included articles in thisstage were articles reporting counseling of diabetic and/ or hypertensive patients by pharmacists. The remaining articles were reviewed for study type to select original articles only and exclude other types such as reports, reviews, systematic reviews, and meta-analyses. Only studies in the English language were defined as articles of relevance. The studies which lacked full-text andprovided abstracts only were excluded. Also, articles with incomplete or overlapped data were excluded (Figure 1). Data review and analysis
The first step involved reviewing the abstracts to determine the data of interest, then full-text reviewing toextract the data. An Excel sheet was used to save and revise the extracted data. Then, such data were transferredto a pre-designed table to summarize the collected data under specific titles.

Results

A final number of eight studies met the eligible criteria and were included in this systematic review [14-21](Table 1).
The articles were published between 2018 and 2024. Thestudy design was heterogeneous between the groups andincluded pre-and post-cohort [14], interventional [15], cluster randomized controlled trial [16], experimental research method with a static group comparison [17], quasi-experimental with pre and post-test group [18], prospective, open-labeled randomized control trial [19], educational interventional prospective [20], andprospective interventional [21]. There were three studiesenrolled T2DM patients [14,16,18], three studies enrolledhypertensive patients [17,19,20], and two studies

included both T2DM and hypertensive patients [15,21]. The total number of patients was 1,390; the number of T2DM patients was 385; the number of hypertensive patients was 620; and the number of both patients was
385. There were seven studies that included two groups: the control group, which included 677 patients, and the interventional group, which included 625 patients. One study included one group of 88 patients who were surveyed pre- and post-counseling [14], and one study was conducted on elderly patients [20].
The subject of counseling was reported in three studies and included counseling on blood sugar level HbA1C [14], counseling on antihypertensive drugs [17], and counseling on treatment outcomes and QOL [21]. The assessed outcomes of counseling included clinical outcomes [14,15,17-19,21], controlling glycemic status [18], adherence [15,17,18,20], health-related quality of
life [16], KAP [15,19,21], [19,21].
The findings of the studies regarding blood glucose level (BGL), fasting plasma blood glucose (FPBG), and HbA1c, it was reported that BGL and HbA1c were significantly reduced after counseling [14], and HBA1c were significantly reduced among the interventioncategory after intervention (p = 0.001) and compared to the controls (p = 0.0001) [16]. In comparison to controls,the intervention group experienced a significant reduction in FPBG ($p < 0.0001$) [15,21]. In addition, FBG and HbA1c were reduced by 2.764 and 9.964, respectively, compared to noncounseling [18].
BP status was significantly improved in the interventional group compared to the control ($p < 0.001$) [20]; both systolic blood pressure (SBP) and diastolic bloodpressure (DBP) were significantly reduced among the intervention category ($p < 0.0001$) [15], SBP (p = 0.03)

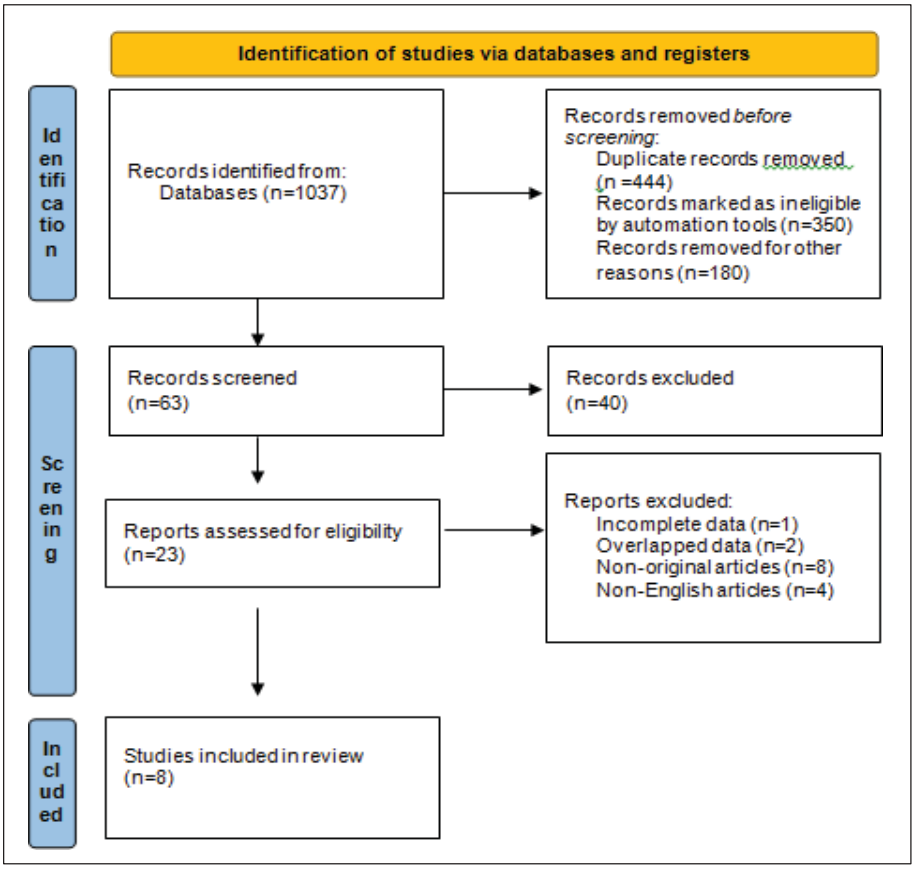

Figure 1. *Planning of eligible criteria.*

[19], ($p < 0.0001$) [21], and DBP (p = 0.04) [19], (p =

0.001) [21]. SBP was reduced significantly at the last counseling meeting compared to the first one among patients who received counseling ($p = 0.001$) [17].

Regarding BMI and lipid profile, BMI was significantlyreduced among the intervention group ($p = 0.005$) [15]. Also, TC ($p = 0.002$), HDL ($p = 0.004$), LDL ($p = 0.02$),

and TG ($p = 0.01$) were improved significantly among the intervention patients [18].

Regarding KAP of the patients, knowledge was significantly improved among the intervention group after counseling compared to controls ($p < 0.0001$) [15]. Interventional patients recorded significant improvementin KAP ($p < 0.0001$) [21] and higher mean percentageof knowledge ($p < 0.0001$), attitude ($p = 0.004$), and practice ($p < 0.0001$) compared to controls [19].

Regarding adherence to medication, compared to the controlgroup, the interventional group reported significantlybetter adherence ($p < 0.0001$) [15], ($p = 0.006$) [18], andimprovement ($p < 0.001$) [20] after the intervention. In addition, adherence was increased significantly among theintervention group at the last counseling meeting comparedto the first one ($p = 0.008$) [17].

Improvements were found after intervention among the interventional group regarding both HRQOL ($p = 0.041$) [16] and QOL, including the physical component ($p =0.0003$) [21].

Discussion

The role of the pharmacist in disease management includes education, monitoring, and referral. Pharmacistscan provide counseling to patients about monitoring theircondition and how to manage out-of-range levels [22]. Patient counseling is a broad concept that describes the procedure by which healthcare professionals try to increase patient knowledge regarding health issues [23]. During contact between patients and pharmacists, patients might ask pharmacists questions that they did not ask the physicians and can get further informationon controlling their condition or disease [22]. Previous literature reported that intervention by pharmacists could improve patients' outcomes regarding different variables,including HbA1c, fasting blood sugar, BMI, BP, and lipid profile [24-26]. Therefore, this systematic review was carried out to identify the influence of counseling diabetic and hypertensive patients by pharmacists. The assessment of both hypertension and T2DM returns to the fact that diabetic patients have a 1.5-3 times increasedprevalence of hypertension compared to nondiabetic ones [27].

Table 1. *Summary of the collected data.*

Author and publication year	Study design	Characteristics of patients	Counseling subject/and outcomes	Results and main findings
Rina et al. [14]	Pre and post-cohort study	-Disease: T2DM -N of patients = 88 patients	-Counseling on BGL and HbA1c -Impact of counseling on clinical outcomes in the management of T2DM	*Controlled BGLs before counseling was 27.7%, and after counseling was 89.8%. *Controlled HbA1C before counseling was 27.3%, and after counseling was 89.8%. *Counseling by pharmacists significantly improved the clinical outcomes of T2DM patients(p = 0.000).
Kwakye et al.[15]	Interventional	-Disease: Co-morbid hypertension and diabetes -N of patients = 338 *Case = 144 *Control = 194	---------- -Impact of counseling on knowledge, adherence, and clinical outcomes body mass index (BMI, SBP, DPB, FPBG)	*Patients in the case group had better knowledge (p < 0.0001) and adherence to medication (p < 0.0001) compared to the control. *The case group had a significant reduction in BMI (p = 0.005), SBP (p < 0.0001), DBP (p < 0.0001), and FPBG (p < 0.0001).
Fajriansyah et al. [16]	Cluster randomized controlled trial	-Disease: T2DM -N of patients = 220 patients *Control = 111 *Interventional = 109	---- -Impact of counseling on health-related quality of life (HRQOL)	*The change in the HRQOL score (post-pre) was 0.01 in the control and 0.04 in theintervention group (p = 0.041). *HbA1c level was significantly reduced among the interventional group (p = 0.001), and it was significantly increased among controls (p = 0.0001), with a significant variationbetween the two groups (p = 0.0001).
Yusransyah et al. [17]	Experimental research method with a static group comparison	-Disease: Hypertension -N of patients = 96 *Control = 48 *Counseling group = 48	-Antihypertensive drug counseling -Impact on adherence and BP	*Counseling by pharmacists resulted in an increase in patient adherence to administrate of antihypertensive drugs comparing the first meeting (mean = 21.40) with the last meeting (24.42) (p = 0.008) and systolic blood decreased at each meeting, where the firstmeeting was mean = 164 mmHg, and the last meeting recorded 145 mmHg of BP (p = 0.001) in the counseling group compared to the control group.

Hening et al. [18]	Quasi-experimental with pretest post- test group	-Disease: T2DM -N of patients = 77 *Control = 38 *Intervention = 39	-------- -Impact on medication adherence, controlling glycemic status, and clinical outcomes (lipid profile, BP)	*In the intervention group, medication adherence (p = 0.006) and clinical variables such as HbA1c (p = 0.003) and lipid profile, including total cholesterol (TC) (p = 0.002), high-density lipoprotein (HDL) (p = 0.004), low-density lipoprotein (LDL) (p = 0.02), triglycerides (TG) (p = 0.01) were improved, with no significant changes in the control groups regarding clinical parameters and adherence score was significantly reduced (p = 0.008). *In comparison to the controls, the intervention group displayed significant improvement in parameters, including fasting blood glucose (FBG) (p = 0.05) and HbA1c (p < 0.0001). *Based on multivariate analysis, counseling by hospital pharmacists was 2.764 times (OR = 2.764) and 9.964 times (OR = 9.964) better than no counseling in improving FBG andHbA1c, respectively. *After adjustment, medication adherence displayed no significance.
Goruntla et al.[19]	Prospecti ve, open-labeled, randomized controltrial	-Disease: Hypertension -N of patients = 192 *Control = 97 *Interventional = 95	---- -Impact on knowledge, attitude, practice (KAP), and blood pressure control	*There was a significant reduction in the mean SBP (p = 0.03) and DBP (p = 0.04) levelsin the intervention compared to the control group at final follow-up visits. *The mean percentage of knowledge (p < 0.0001), attitude (p = 0.004), and practice (p < 0.0001) towards hypertension management were significantly improved in the intervention compared to controls.
Shrestha et al.[20]	Educatio nal intervent ional prospecti ve	-Disease: Hypertension -N of patients = 332 elderly patients *Control = 166 *Interventional = 166	------- -Impact on antihypertensive medication adherence	*Low adherence was found among 13.85% of interventional and 86.14% of controls. *The adherence score of the interventional group was significantly improved (p < 0.001) after the intervention, whereas no significant improvement occurred in the control group (p = 0.3) at follow-up. *Status of BP was improved in the intervention category than the control (p < 0.001).
Puvvada and Muthukum ar [21]	Prospecti ve intervent ional	-Disease: Hypertension and T2DM -N of patients = 47	-Counseling on treatment outcomes and QOL	*Patient counseling by pharmacists resulted in improvement among the interventional group regarding KAP (p < 0.0001), SBP (p < 0.0001), DBP (p = 0.001), and levels of blood sugar (p < 0.0001) and QOL, including the aspects of physical

		*Control = 23 *Interventional = 24	-Impact on KAP	component (p = 0.0003). *No significant improvement was noted for controls.

T2DM; type 2 diabetes mellitus, BGL; blood glucose level, BMI; body mass index, SBP; systolic blood pressure, DBP; diastolic blood pressure, FPBG; fasting plasma blood glucose, HRQOL; health-related quality of life, VAS; visual analog survey, HBP; high blood pressure, HC; hypercholesterolemia, TC; total cholesterol, HDL; high-density lipoprotein, LDL, low-density lipoprotein, TG; triglycerides, FBG; fasting blood glucose.

The essential components of diabetic counseling include counseling about the disease, especially requiring adherence to medication; counseling regarding lifestyle modification, including diet, exercise, and physical activity; counseling regarding medications, counseling regarding complications; and counseling regarding maintaining blood sugar [22]. In the current analysis, only three studies reported the subject of counseling[14,17,21], whereas the remaining five studies did not report the subject of counseling. Similarly, a previous systematic review reported that most included studies did not report the material and methods used in pharmacist- led intervention on diabetes outcomes [28].

The co-existence of diabetes and hypertension is among almost 40%-60% of T2DM patients [27]. In the current analysis, there were two studies conducted on both T2DM and hypertension [15,21]. One study exploredthe role of community pharmacists in improving controlof BP among patients with hypertension. The study demonstrated that pharmacists providing pharmaceutical care led to improvement in diastolic pressure and adherence to therapy [29]. In the current analysis, BPe was significantly improved and controlled among patients who received counseling by pharmacists; both systolic blood pressure (SBP) and diastolic blood pressure (DBP) were significantly reduced after counseling among patients who received counseling.

Low levels of compliance and knowledge can lead to complications that can affect BP [30]. Consequently, adherence to medication can act as a deterrent to uncontrolled BP [5]. Also, awareness andadherencetowarddiabetes treatment can be increased by providing proper counseling to the patients with the help of pharmacists, nurses, and physicians [31-33]. In this analysis, adherenceto medication was improved among patients who receivedcounseling in all the studies that investigated adherence to medication, regardless of whether the population of the study was diabetic patients or hypertensive patients. In addition, the KAP of patients with hypertension and diabetes were improved after counseling, and this might explain the increase in adherence to medication. Increased KAP and adherence to medication would, in turn, improveBP and glycemic control, which in turn reduce the likelihood of severe complications.

Ascoping review included 17 studies with 136,026 patientsand focused on the effect of pharmacist-led intervention on medication adherence and clinical outcomes among hypertensive patients and hyperlipidemia. It was reportedthat such interventions by pharmacists were associated with improved adherence to medication by the patients but were less likely to be consistently associated withthe attainment of clinical outcomes [34]. However, in thecurrent systematic review, it was found that not only didadherence improve, but BP did as well. In addition, BMIand lipid profile were significantly improved among patients who received counseling.

Complications associated with diabetes negatively affect the QOL of the patients; QOL is defined as a multidimensional term that refers to the total well-being of an individual, including social, psychological, and physical health status[7]. Counseling of patients can motivate patients for betterQOL and can lead to improvement in QOL [23]. One of themost significant goals of health interventions and counselingis to improve the QOL of patients affected by diseases [27]. Only two studies in the current analysis focused on QOL and HRQOL; however, both studies reported improvements. HRQOL was significantly improved after counselingamong the patients, but the improvement of QOL was reported regarding the physical component. In chronic conditions such as diabetes and hypertension, HRQOL isa more important outcome. HRQOL has been found to bepoorer among diabetic patients [27]. Also, hypertension wasfound to be associated with adverse outcomes regarding HRQOL [35].

A recent systematic review included 15 studies that revealed that pharmacists' counseling T2DM patients resulted in a significant effect on reducing the level of both blood sugar and glycosylated hemoglobin (HbA1c).It was revealed that pharmacists had a vital role in the management and control of the blood sugar of T2DM patients by counseling them. Such controlling of blood sugar contributed to better diabetes care and considerablyreduced direct medical costs associated with the condition [6]. These findings are in agreement with the current study results, as the studies conducted on T2DM patients reported significant improvement in blood sugarlevel, HbA1c, and FBG after counseling. In addition,the reduction of FBG and glycosylated hemoglobin were reduced by more than twofold and almost tenfold, respectively. A systematic review by Iqbal et al. [28] revealed that pharmacist-led

interventions among diabetic patients significantly improved the outcomesof the patients and the complications of the disease [28]. A systematic review and meta-analysis identified the impact of pharmacists-led intervention for adults with T2DM and revealed that the intervention significantly improved HbA1c for T2DM patients [36], and this is in agreement with the current findings.
Another systematic review enrolled hypertensive patients and included 20 studies that found that counseling resulted in a favorable impact on the prevention and reduction of complications. In addition, the knowledge of patients regarding hypertension and self-efficacy was improved. Furthermore, adherence to counselingand consultation medication assisted in sustaining the BP of the patients within the normal range. Hence, counseling of hypertensive patients had a positive effect on the patients [1]. Similarly, it was found that counseling hypertensive patients by pharmacists resulted in significant improvement in BP by controllingand significant reduction of SBP and DBP. Also, the counseled patients reported improvement in knowledge and medication adherence.
In a meta-analysis that assessed the impact of pharmacist interventions on BP, it was found that pharmacist interventions resulted in a greater reduction in SBP and DBP. In addition, it was found that the impact tended to be greater if the intervention was led by the pharmacist and was done at least monthly [37]. These findings werein line with the current study findings, as it was found that both SBP and DBP were significantly reduced after counseling among hypertensive patients.

Conclusion

Counseling patients with diabetes and hypertension by pharmacists resulted in improving the outcomes of diabetes and hypertension, which represented improvements in glycosylated hemoglobin, fasting blood sugar, BP, and SBP and DBP reduction. In addition, counseling of patients with hypertension and/or diabetesresulted in improvement in BMI, lipid profile, adherenceto medication, KAP, as well as HRQOL. Therefore,pharmacists have an important role in controlling diabetesmellitus and hypertension by counseling the patients, regardless of the counseling duration. In addition, counseling by pharmacists resulted in a wide range of positive outcomes that were not restricted to clinicaloutcomes only. Therefore, regardless of the type of condition of patients, pharmacists have a significant rolein controlling and managing diabetes and hypertension.

List of Abbreviations

BGL Blood glucose levelBMI Body mass index
DBP Diastolic blood pressureFBG Fasting blood glucose
FPBG Fasting plasma blood glucoseHDL High-density lipoprotein HRQOL Health related quality of life
KAP Knowledge, attitude, and practiceLDL low-density lipoprotein
QOL Quality of life
SBP Systolic blood pressureTC Total cholesterol
T2DM Type 2 diabetes mellitusTG Triglycerides

Conflict of interest

The authors declared that there is no conflict of interestregarding the publication of this article.

Funding

None.

Consent to participate

Not required.

Ethical approval

Not required.

Author details

Hussam Ahmed Kariri[1], Ashjan Mohammed Jatem[1]
1. Jazan Armed Forces Hospital, Jazan, Saudi Arabia

References

1. Adnelda WP, Kardela W, Ifora I. A review: effect ofcounseling adherence and blood pressure

control in hypertensive patients. Sci Int (Lahore). 2020;32(6):667– 72.
2. Triyanto E. Pelayanan keperawatan bagi penderita hipertensi secara terpadu. 1st ed. Yogyakarta, Indonesia: GRAHA ILMU; 2014. pp 1–16.
3. Meinema JG, Dijk N, Beune EJAJ, Jaarsma DADC, Van Weert HCPM, Haafkens JA. Determinants of adherence to treatment in hypertensive patients of African descent and the role of culturally appropriate education. PLoS One. 2015;10(8):e0133560. https://doi.org/10.1371/ journal. pone.0133560
4. Warren-Findlow J, Seymour R, Brunner Huber L. The association between self-efficacy and hypertension self- care activities among African adults. Bone. 2013;23(1):1–7.
5. Ambaw AD, Alemie GA, Wyohannes SM, Mengesha ZB. Adherence to antihypertensive treatment and associatedfactors among patients on follow-up at the University of Gondar Hospital, Northwest Ethiopia. BMC Public Health. 2012;12(1):282. https://doi.org/10.1186/1471-2458-12-282
6. Rina H. Effect of pharmacist counselling on patients with type 2 diabetes mellitus in reducing blood sugar levels: a systematic literature review. Int J Basic Clin Pharmacol. 2024;13(1):152–8. https://doi.org/10.18203/2319-2003.ijbcp20233827
7. Coons SJ. Health outcomes and qualityof life principles. In: Dipiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM, editors. Pharmacotherapy: a pathophysiological approach. 4th ed. Norwalk, CT: Appleton & Lange; 1999. pp 12–20.
8. UK Prospective Diabetes Study (UKPDS) Group. Intensive blood- glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS33). Lancet. 1998;352:837–53. https://doi.org/10.1016/ S0140-6736(98)07019-6
9. Testa MA, Simonson DC. Health economic benefits and quality of life during improved glycemic control in patients with type 2 diabetes mellitus. JAMA. 1998;280:1490–6. https://doi.org/10.1001/jama.280.17.1490
10. Nugraheni AY, Puspitasari I, Andayani TM. Pengaruh konseling apoteker dengan alat bantu pada pasien diabetesmelitus. J Manag Pharm Pract. 2015;5(4):233–40.
11. Sczupak CA, Conrad WA. Realtionship between patient- oriented pharmaceutical services and therapeutic outcomes of ambulatory patients with diabetes mellitus. Am J Hosp Pharm. 34:1238–42. https://doi.org/10.1093/ ajhp/34.11.1238
12. Van Onzenoort HAW, Verberk WJ, Kessels AGH, Kroon AA, Neef C, Van Der Kuy PHM, et al. Assessing medication adherence simultaneously by electronic monitoring and pill count in patients with mild-to-moderate hypertension. Am J Hypertens. 2010;23(2):149–54. https://doi.org/10.1038/ajh.2009.207
13. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies thatevaluate health care interventions: explanation and elaboration. PLoS Med. 2009;6(7):e1000100. https://doi. org/10.1371/journal.pmed.1000100 Rina H, Nasution A, Khairunisa. Impact of pharmacist counseling on the clinical outcomes in the management of type 2 diabetes mellitus outpatients admitted to a hospital. Int J Basic Clin Pharmacol. 2024;13(1):42–6. https://doi.org/10.18203/2319-2003.ijbcp20233818
14. Kwakye AO, Buabeng KO, Opare-Addo NA, Owusu-Dabo E. Clinical pharmacists education and counselling in patients with co-morbid hypertension and diabetes in a Municipal hospital in Ghana. Afr J Pharm Pharmacol. 2021;15(10):183–90. https://doi.org/10.5897/AJPP2021.5267
15. Fajriansyah, Iskandarsyah A, Puspitasari IM, Lestari K. Impact of pharmacist counseling on health-related quality of life of patients with type 2 diabetes mellitus: a cluster randomized controlled study. J Diabetes Metab Disord. 2020;19:675–82. https://doi.org/10.1007/s40200-020- 00528-x
16. Yusransyah, Halimah E, Suwantika AA. Effect of pharmacist counseling on adherence and blood pressureof hypertensive Prolanis patients in sixteen primary healthcare centers. J Adv Pharm Edu

Res. 2020;10(4):8– 14.
17. Hening WN, Sartika RA, Sauriasari R. Effect of hospital pharmacist counseling on clinical outcomes of type
2 diabetes mellitus outpatients. J Res Pharm Pract. 2019;8(3):155–61. https://doi.org/10.4103/jrpp.JRPP_19_67
18. Goruntla N, Mallela V, Nayakanti D. Effect of pharmacist directed counselling services on knowledge, attitude, and practice (KAP) and blood pressure control in hypertensive patients: a randomized control trial. Int J Pharm Sci Res. 2019;10:5109–16.
19. Shrestha S, Karki R, Ghimire M. Impact of pharmacist counselling on medication adherence among elderly patients on antihypertensive therapy in a tertiary care hospital of Nepal. Eur J Med Sci. 2019;1(1):40–7. https:// doi.org/10.46405/ejms.v1i1.6
20. Puvvada RC, Muthukumar VA. Impact of patient counselling on the knowledge, attitude, practice and quality of life in patients with hypertension with diabetes mellitus-II. Hypertension. 2018;14:16.
21. Patel I, Rajput DS. Role of pharmacist in counseling diabetic patients in tertiary Care Teaching Hospital. Eur JMed Vet Sci Novus. 2021;1(01):4.
22. Thanveer PK, Danishap, Hemna. Impact of Use of Patient Counselling in Diabetic Patients: A Review Article. Int J Pharm Res Appl. 2023;8(3):1060–4.
23. Lau BT, Ismail SZ, Ng SY, Mohmmad N. Impact of pharmacistled diabetes program on glycated hemoglobin and diabetesrelated hospitalizations in a district-level hospital: a pilot retrospective cohort study. Int J Adv Life Sci Res. 2018;1:26–36. https://doi.org/10.31632/ ijalsr.2018v01i02.005
24. Lim PC, Lim K, Embee ZC, Hassali MA, Thiagarajan A, Khan TM. Study investigating the impact of pharmacist involvement on the outcomes of diabetes medication therapy adherence program Malaysia. Pak J Pharm Sci. 2016;29:595–601. Butt M, Mhd Ali A, Bakry MM, Mustafa N. Impact of a pharmacist led diabetes mellitus intervention on HbA1c, medication adherence and quality of life: a randomized controlled study. Saudi Pharm J. 2016;24:40–8. https:// doi.org/10.1016/j.jsps.2015.02.023
25. Babu DNS, Reddy KM, Kumar GR, Narasimharao D, Kumar JNS, Rani TS. Assessment of the impact of pharmacist provided patient counseling on treatment outcomes and quality of life in hypertensive and diabetes mellitus type-ii patients. Int J Univers Pharm Bio Sci. 2014;3(4):5.
26. Iqbal MZ, Khan AH, Iqbal MS, Sulaiman SA. A review of pharmacist-led interventions on diabetes outcomes: an observational analysistoexplorediabetescareopportunitiesfor pharmacists. J Pharm Bioallied Sci. 2019;11(4):299–309.https://doi.org/10.4103/jpbs.JPBS_138_19
27. Marfo AF, Owusu-Daaku FT. Exploring the extended role of the community pharmacist in improving blood pressurecontrol among hypertensive patients in a developing setting. J Pharm Policy Pract. 2017;10(1):39. https://doi. org/10.1186/s40545-017-0127-5
28. PeacockE,Krousel-WoodM.Adherencetoantihypertensive therapy. Physiol Behav. 2018;176(1):139–48.
29. Adibe MO, Obinna UP, Uchenna IN, Michael UC, Aguwa CN. Effects of an additional pharmaceutical care intervention versus usual care on clinical outcomes of Type 2 diabetes patients in Nigeria: a comparative study. Sci Res Essays. 2014;9:548–56. https://doi.org/10.5897/ SRE2013.5558
30. Nascimentoa T, Braz N, Gomes E, Fernandez-Arche A, De La Puerta R. Self-care improvement after a pharmaceutical intervention in elderly type 2 diabetic patients. Curr Diabetes Rev. 2015;12:120–8. https://doi.org/10.2174/1573399811666150722130232
31. van Eikenhorst L, Taxis K, van Dijk L, de Gier H. Pharmacistled self-management interventions to improvediabetes outcomes: a systematic literature review and meta-analysis. Front Pharmacol. 2017;8:891. https://doi. org/10.3389/fphar.2017.00891
32. Elnaem MH, Rosley NF, Alhifany AA, Elrggal ME, Cheema
E. Impact of pharmacist-led interventions on medication adherence and clinical outcomes in

patients with hypertension and hyperlipidemia: a scoping review of published literature. J Multidiscip Healthc. 2020:635–45. https://doi.org/10.2147/JMDH.S257273

33. Walker SR, Rosser RM, editors. Quality of life assessment: key issues in the 1990s. Berlin, Germany: Springer Science& Business Media; 2012.
34. Coutureau C, Slimano F, Mongaret C, Kanagaratnam L. Impact of Pharmacists-Led Interventions in PrimaryCare for Adults with Type 2 Diabetes on HbA1c Levels: A Systematic Review and Meta-Analysis. Int J Environ ResPublic Health. 2022;19(6):3156. https://doi. org/10.3390/ijerph19063156
35. Santschi V, Chiolero A, Colosimo AL, Platt RW, Taffé P, Burnier M, et al. Improving blood pressure control throughpharmacist interventions: a meta-analysis of randomizedcontrolled trials. J Am Heart Assoc. 2014;3(2):e000718. https://doi.org/10.1161/JAHA.113.000718