



RESEARCH ARTICLE

DIABETES SELF MANAGEMENT: ROLE OF KNOWLEDGE

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ABSTRACT

Background: Diabetes, one of the dangerous non communicable diseases. Management of type 2 diabetes becomes difficult with poor knowledge regarding disease condition. This review will focus on role of knowledge of people with type 2 diabetes in the management of their disease condition.

Aim: To review the knowledge of people with type 2 diabetes about their disease and its management.
Methods: EBSCO discovery service was used to conduct a comprehensive literature search to identify all relevant articles published in English language from January, 2000 to December, 2016. Through EBSCO discovery services the following electronic databases were searched: Science Direct, CINAHL Plus with Full Text, MEDLINE, Academic OneFile, Scopus® and Access Medicine. Of the 13,605 studies retrieved in the initial search, 33 studies were retained for the final review.

Results: Of 33 studies, majority of the studies shown that people with type 2 diabetes has poor to moderate level of knowledge. Even though few studies demonstrated good level of knowledge in people with type 2 diabetes intervention focused on converting knowledge into practice is required.

Conclusion: Future research activities are needed to be focused on improving knowledge regarding diabetes and its management in people with type 2 diabetes and interventions to translate those knowledge into practice will be the key in diabetes management.

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INTRODUCTION

Worldwide approximately 415 million people are suffering with type 2 diabetes i.e. 8.8% of global population are affected and estimates shows that this burden is on the rise and by 2040 it may reach to 642 million. South East Asia accounts for an estimated 78.3 million and out of which 69.2 million were reported from India (IDF Atlas, 2015). A prevalence of 16% of people with diabetes was found in costal population of Karnataka (Rao *et al.*, 2010). Ethnic and genetic susceptibility to diabetes is high among Indians and also threshold limit is low for the environmental risk factors. Onset of type 2 diabetes mellitus is becoming more common among adolescents and youth (Ramachandran *et al.*, 2009). Diabetes at young age poses a risk of chronic long-term complications at a younger age, where they experience lower quality of life and most productive years of life is affected with morbidity which might lead to mortality at the earliest. Around 53% of people with diabetes die under the age of 60 years due to diabetes (IDF Atlas, 2015). Educational programmes and health outreaches on preventive aspects such as modifying diet, physical activity

and lifestyle modifications may improve the level of knowledge among people with diabetes (Obirikorang *et al.*, 2016). Patient's knowledge, skills and practice can be improved by the appropriate mode of educational interventions. Structured patient education can help them in controlling their disease and with interventions which increases compliance with therapy rather than just helping them in monitoring blood glucose levels. The results of educational intervention reflected in enhanced quality of life of people with diabetes. Therefore, structured education need to be a part of diabetes management (Magurova *et al.*, 2012).

Diabetes knowledge

Knowledge of diabetes, attitude and self-management of people with diabetes are important aspects that have an impact on the quality of life of people with type 2 diabetes (Kueh *et al.*, 2015). Even in geriatric patients knowledge and medication adherence can be improved with effective diabetic education (Omar *et al.*, 2014; Ghannadi *et al.*, 2016). Significant relationship was observed between diabetes knowledge and blood glucose monitoring, which highlights the importance of continuous education to people with diabetes, whereby impact of diabetes minimized with effective

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management. Patients who are at risk of developing diabetic foot ulcers will also be benefited with continuous diabetic education (Gondal *et al.*, 2007). Education can be effective if we have awareness about patient's characteristics such as knowledge, attitude and practice (Shah *et al.*, 2009). Improving knowledge regarding diabetes and its management forms the basis for diabetes self management. Keeping blood glucose level under control and thereby preventing or delaying the occurrence of long term complications related to diabetes so that people with diabetes can lead a good quality of life.

Need of the review

Still a considerable number (38.23 %) of people with diabetes in a study believed that their condition can be cured and the area of concern was knowledge about medication (Shah *et al.*, 2009). A low level of diabetes knowledge was found among a significant number of diabetic patients, poor self-care, poor knowledge about foot care (Khamseh *et al.*, 2007), poor foot care practices (Jinadasa *et al.*, 2011) and low level of medication adherence was evident (Shrestha *et al.*, 2015; Kassahun *et al.*, 2016). In India there is limited availability of self-management education (IDF Global score card, 2014). IDF Global guideline highlights the importance of making structured patient education as an integral component of diabetes management (IDF Global guideline, 2005). Good knowledge of nutrition will aid individuals with type 2 diabetes in choosing healthier food which enhances the quality of life (Breen *et al.*). As the incidence of diabetes is on the rise, education and empowerment of patient in healthcare facility becomes crucial in ensuring good glycemetic control (Verma *et al.*, 2012). Most of the respondents knew that they are responsible for their diabetes management (AlAboudi *et al.*). Patients with good understanding of their HbA1c demonstrated better glycemetic control and diabetes self-management behavior (Yang *et al.*, 2016). But public awareness regarding role of HbA1c in better glycemetic control and development of complications related to diabetes has never improved, despite efforts made by various organizations as evidenced by most of the patients do not know about their HbA1c level and target and many of them not even heard of HbA1c (Kumpatla *et al.*, 2010). Patients need to be made aware of the asymptomatic phase of diabetes mellitus and its long term complications. At the same time, efforts needed to sensitize them about the importance of regular treatment. Integrated interventional management approach is the need of the hour to overcome the barriers like lack of HbA1c awareness, medication non-adherence, poor diabetes knowledge and self-care behaviours, (Ramachandran *et al.*; Kassahun *et al.*, 2016). It is very important to find additional ways to improve the knowledge of people with diabetes about their condition (Kueh *et al.*, 2015). In this context it's crucial to assess the knowledge of people with diabetes.

Aim: To review the knowledge of people with type 2 diabetes regarding their disease and its management.

Objectives: To assess the knowledge of people with type 2 diabetes regarding their disease and its management.

METHODS

Search strategy methods

EBSCO discovery service was used to conduct a comprehensive literature search to identify all relevant articles

published English language from January, 2000 to December, 2016. Through EBSCO discovery services the following electronic databases were searched: Science Direct, CINAHL Plus with Full Text, MEDLINE, Academic OneFile, Scopus® and Access Medicine. Of the 13,605 studies retrieved in the initial search, 33 studies were retained for the final review based on the inclusion criteria.

Types of studies

Descriptive cross sectional study.

Types of participants

People with type 2 diabetes from the age of 30 years and above

Setting

Nursing home, Hospital and Community

RESULTS

This systematic review was conducted as per the guidelines explained in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA). Electronic database search retrieved 13,605 studies. 86 full text studies were downloaded and as 22 studies found irrelevant to the topic excluded them from the review and 64 studies remained. Due to lack of details regarding research design (6 studies), sampling method (6 studies), setting (8 studies), results (4 studies), inclusion and exclusion criteria (7 studies) a total 31 studies have been excluded from the review, with that 33 studies remained for the final review (Figure 1).

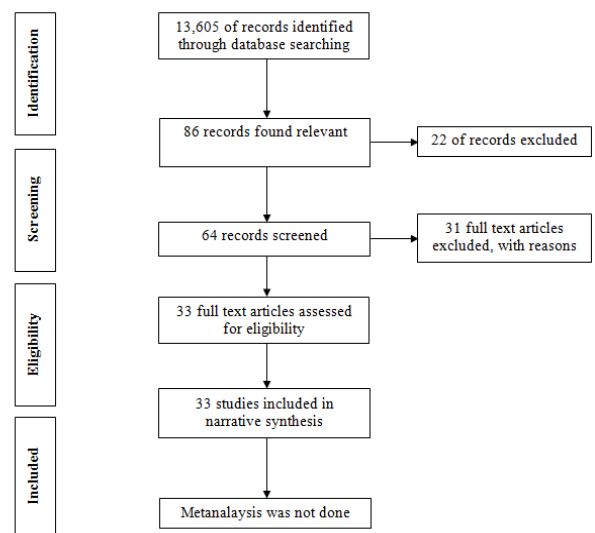


Figure 1. PRISMA flow chart

Summary of the findings

This systematic review was based on 33 studies which were retrieved through electronic search. A total of 15,747 participants were found in those 33 studies; 52 participants were the smallest sample size and largest sample size was 5,957 participants. Each study included in review is attempted to assess the knowledge of people with diabetes and many of the studies tried to assess the attitude, health literacy, coping, self care practice, self efficacy, self management and quality of life.

Table 1. Methodological description of included studies

Sl. No and Author	Year	Country	Variables	Sample size	Design	Duration	Findings	Conclusion
1.Shima Ghannadi	2016	Iran	Knowledge	117	Cross-sectional study	April to June 2014	Significant negative correlation was found between patients' knowledge and attitude with their HbA1c level and also with their self-care activities.	Patients' Knowledge attitude and practice scores have a effect upon self-care behavior which stresses the need for effective diabetes education intervention in developing countries.
2.Chamil Vidusha Madushan Jinadasa	2011	Sri Lanka	Knowledge	110	Descriptive cross sectional study.	November 2008 to March 2009	A Statistically significant difference was found between the knowledge about foot care and practice scores.	Results demonstrated knowledge regarding diabetic foot disease was found to be satisfactory.
3.Viral N. Shah	2009	India	Knowledge, attitude and practice	238	Descriptive cross sectional study.	June to November 2007	The pathophysiology of diabetes was known by 46% of patients. About 38.23% still believed that diabetes is curable.	Drug therapy of diabetes was the area of concern which needs to be addressed.
4.Brittany L. Smalls	2012	United states	Diabetes knowledge	378	Descriptive cross sectional study.	June to August 2010	Significant correlations was found between emotional approach to coping and medication adherence, self-care behaviors and diabetes knowledge	Positive diabetes outcomes can be expected when Coping through an emotional approach is used.
5.J Kishore	2015	India	Knowledge practices health seeking behavior	98	Cross sectional study	July to September 2012	Majority of participants in both urban slum and rural area have knowledge about at least one component of management but significantly lesser in urban (83.9%) than rural area (97.0%).	Awareness has to be created among patients about asymptomatic phase of diabetes and its complications. Efforts also needed to sensitize them about the importance of medication adherence.
6.X. He	2007	China	Diabetes knowledge	100	Cross-sectional study	-	Diabetes knowledge significantly correlated with Age and occupation; age had negative correlation with diabetes knowledge.	Educative interventions need to be focused on applying the knowledge to different practical situations.
7.Sheikh Mohammed Shariful Islam	2015	Bangladesh	Knowledge	515	Cross-sectional study	September 2013 to July 2014	Significant association was found between knowledge on diabetes and gender, marital status, education, income, BMI, duration of diabetes and family history of diabetes, but not with HbA1c.	Limited knowledge on the causes, management and risk factors was found, even though professional health education and care received from a tertiary diabetic hospital.
8.Shrestha N	2015	Nepal	Knowledge	132	Cross-sectional design	June to August 2014	Significant relationship was found between diabetes knowledge score and age, marital status, level of education, occupation, and family history of diabetes.	Poor level of diabetes knowledge found among adults with diabetes. Future studies need to be focused on developing need based awareness program.
9.Tefera Kassahun	2016	Ethiopia	Knowledge, self-care behaviours and adherence to medications	309	Cross-sectional survey	February and April 2014	Majority of the patients had low level of knowledge regarding diabetes and poor self care behaviours.	Study findings stresses the need of integrated interventional management for effectively managing diabetes and its complications
10.Ronak Karbalaiefar	2016	Iran	Knowledge, attitude and practice	120	Cross-sectional study	April to June 2014	Significant and direct relationship was found between patients' knowledge with their attitude and practice.	Good level knowledge was found, but self-care and health related quality of life was at low level.
11.Murtaza Gondal	2007	Pakistan	Knowledge and practices of foot care	100	Cross-sectional study	April to May 2007	Majority (78%) of the people with diabetes had knowledge about care of callosities, minor injuries and cuts. But, only 34% patients inspected their feet daily which shows the gap between knowledge and practice.	Ongoing foot-specific education has to be provided to the people with diabetes who are at risk of developing diabetic foot ulcers

12.Nadir Kheir	2011	Qatar	Knowledge, attitude and practices	54	Cross-sectional study	January 2008 to March 2009	Highly significant correlation was found between knowledge and attitude. The knowledge and attitude were positively associated psychological status of the patient	The data provided can be useful for healthcare practitioners in tailoring educational programmes aimed at improving diabetes control.
13.Binh T	2015	Vietnam	Knowledge	2580	Cross-sectional study	July to November 2011	The study shows a low level of diabetes knowledge among the general population aged 40–64 years, and significantly lower awareness in rural areas compared with urban areas.	The limited awareness has indicated the urgent need for education to improve the T2D knowledge on risk factors, serious level, complications, prevention and treatment
14.Satyavani Kumpatla	2010	Tamil Nadu, India	Knowledge about HbA1c test	480	Cross-sectional survey	Four months in the year 2008.	Seventy four per cent of the subjects had awareness about HbA1c test and about 43% of those who knew HbA1c test also knew their target goal. 33% remember their last HbA1c result.	Awareness about HbA1c had a positive impact on maintenance of better glycemic control.
15.Mohammad Ebrahim Khamseh,	2007	Tehran, Iran.	Knowledge and practice of foot care	148	Cross-sectional study	October 2006 to March 2007	Patients who had higher level of education had a significant higher knowledge score. Patients who had diabetes more than 10 years were more knowledgeable than those who had diabetes less than 10 years	Patients' knowledge of self-care about their foot are inadequate
16.Farzana Saleh	2012	Bangladesh	Knowledge and self-care practices	508	Cross-sectional study		Approximately 16%, 66%, and 18% of respondents had good, average, and poor (GAP) basic knowledge respectively and 10%, 78%, and 12% of respondents had GAP technical knowledge, about diabetes mellitus.	Newly diagnosed type 2 diabetics had similar levels of basic and technical knowledge of diabetes mellitus.
17.Shengnan Yang	2016	China	Knowledge of A1c	5957	Cross-sectional survey	April to July 2010	Patients from Eastern region had highest and Western region had lowest understanding of the A1c.	Better diabetes self-management behavior was observed in patients who understood well their A1c.
18.Yaa Obirikorang	2016	China	Knowledge of complications of diabetes mellitus	630	Descriptive study	February to April 2015	Majority 378 (60.0 %) of type 2 diabetes patients did not have knowledge on diabetes complications, 169 (26.9 %) had inadequate knowledge on diabetics complication while 82 (13.1%) had adequate knowledge.	Diabetic educative programs like using mass media can improve self-regulatory awareness of diabetic complications which may reduce the morbidity and mortality of diabetic patients.
19.Dagmar Magurova	2012	Turkey	Knowledge of diabetes	289	Observational study	October 2009 and January 2010	The patients having received diabetes education scored higher than those that did not.	The overall contribution of education reflects in improving the quality of life of the patient and his/her family.
20.Idongesit L. Jackson	2014	Nigeria	Knowledge of self-care	303	Descriptive, cross sectional survey	June 2012 to February 2013	The majority of the study sample (79.5%) had 70% or more overall knowledge level about self-care. Self-care knowledge was associated with level of education, monthly income and duration of diabetes.	The reach and frequency of diabetes messages need to be increased to improve patients' knowledge of self-care and hence, active participation in their care.
21.Muhammad Umer Ahmed	2016	Pakistan	Knowledge, Attitude, and Self Care Practices	139	Cross sectional survey	June 2014 to October 2014	Only 18.7% had knowledge regarding the complications of diabetes mellitus. Only 8.6% of participants checked their blood glucose levels at home regularly, and only 4.3% visited their physicians regularly for check-ups.	There is a need for increased diabetes related education and for developing positive attitudes towards reduction of diabetes related complications.
22.Grace Marie V Ku	2015	Philippines	Knowledge, attitudes and perceptions	549	Cross-sectional study	October 2010 to September 2011	Perceived self-efficacy was significantly associated with all four self-management practices.	Higher knowledge, attitude, and perception scores were noted among those with better self-efficacy perceptions, which was associated with better self-care behavior.

23.Gregory Joseph Ryan A. Arden ^a	2010	Philippines	Knowledge, attitudes and practices	156	Cross-sectional analytic study		The overall mean percentage score on knowledge was 43%. Less than half of the respondents strongly believed in the need for patient autonomy (38%).	Evaluating knowledge, attitudes and practices becomes important in understanding observed behaviors and in guiding behavioral change.
24.Ibrahim Suliman AlAboudi	2016	Saudi Arabia	Knowledge, attitudes, and quality of life	75	A cross-sectional descriptive study	April to July 2012	Of 75 diabetic patients, 14.7% had poor knowledge; 72% had moderate knowledge, and only 13.3% had good knowledge.	HRQoL and knowledge scores were moderate in type 2 diabetic patients and most of the respondents knew that they are responsible for their health.
25.Yee Cheng Kueh	2015	Australia	Knowledge, attitudes, and self-management	291	Cross sectional study	-	Diabetes knowledge, attitudes, and self-management are important factors that can impact the QoL among people with type 2 diabetes.	Diabetes knowledge, attitudes, and self-management are important factors that can impact the QoL in diabetes patients
26.Andrea M. Mahon	2016	Ireland	Diabetes Knowledge	52	Cross-sectional study	10-week period	Inappropriate foot care practices were found across both cohorts	The area of concern is the unawareness about uncontrolled blood glucose and its relationship to diabetic foot complications.
27.D.P. Perera	2013	Moratuwa, Sri Lanka.	Knowledge	150	Cross-sectional study	1 st July to 1 st August 2009	Even though 70% of patients had a good knowledge score, knowledge regarding symptoms of poor control and importance of regular follow-up was the area of concern.	Critical gaps in patients knowledge can be addressed through education programmes.
28.Brittany L. Smalls	2013	Southeaster n United States	coping, knowledge, and diabetes self-care behaviors	378	Cross-sectional study	June to August 2010	Significant correlations were found between emotional coping and self-care behaviors.	emotional coping is significantly associated with behaviors which leads to positive diabetes outcomes.
29.Nazli Atak	2008	Turkey.	Knowledge, self management behaviours and self efficacy	80	Randomized single blind controlled study- pre and post test design.	2 weeks	A significant difference was observed between the intervention and control groups. Improvements were seen in taking regular walks, regulating blood glucose levels and in diabetes self efficacy mean scores	Patient education had a significant effect on self efficacy in patients with type 2 diabetes.
30.Namratha R. Kandula	2009	USA	Health literacy and knowledge	190	Pretest posttest design	-	Patients across all literacy levels had significant increase in knowledge scores after viewing the multimedia diabetes education programs.	Learning gap between patients with low and high literacy did not reduce with the use of Multimedia diabetes education program
31.Waleed M Sweileh	2014	Palestine	Knowledge	405	Cross-sectional survey	-	People with diabetes more likely to be non-adherent if they over concern about side effects of anti-diabetic medications	Improvement of knowledge of diabetes patients regarding their illness can influence positively therapeutic outcome
32.Lifeng Fan	2013	Canada	Foot self-care knowledge, self-efficacy.	56	One group repeated measures design	3-week period	Foot self-care educational intervention was found to be effective in improving foot self-care knowledge.	Further research with strong methodology is needed to confirm the findings.
33.Beverly Waller	2010	USA	Knowledge	60	Exploratory study using survey design	November 2007 to March 2008	People with diabetes who attended diabetes education classes had a statistically significant higher knowledge of the glycaemic index and use of it.	In providing up-to-date consistent diabetes care by certified nurse diabetes educators is a positive move.

People with type 2 diabetes were assessed for knowledge on various aspects of diabetes like glycemic control, importance of HbA1c, diet, physical activity, medication adherence, foot care and complications related to diabetes. Most of the studies included in this systematic review advocate improving knowledge of people with type 2 diabetes about their condition. The crucial aspects in management of type 2 diabetes are diet, physical activity, medication adherence (Shah *et al.*, 2009; Kishore, 2015) and foot care (Jinadasa *et al.*, 2011; Magurova *et al.*, 2012; Khamseh *et al.*, 2007; Mahon *et al.*, 2016), and self management (Ghannadi *et al.*, 2016; Karbalaefifar *et al.*, 2016; Khamseh *et al.*, 2007; Jackson *et al.*, 2014; Ku *et al.*, 2015; Atak, 2008), awareness of HbA1c (Kumpatla *et al.*, 2010; yang *et al.*, 2016) and complications of diabetes. Management of diabetes would be more effective with the use of integrated approach (Kassahun *et al.*, 2016) and emotional approach can yield more positive results (Smalls *et al.*, 2013). Majority of the studies showcased the importance of educational interventions in improving knowledge and translation of gained knowledge into practice, which helps them in self management of the condition effectively thereby enhancing the quality of life of people with type 2 diabetes (AlAboudi *et al.*, 2016; Kueh *et al.*, 2015; Magurova *et al.*). However, further research can aid to find out novel approaches for translation of knowledge into practice.

DISCUSSION

Generally among people with diabetes there is a poor foot care practice, medication adherence, irregular food pattern, poor dose modifying ability when necessary and difficulty in setting a therapeutic goal (Kheir *et al.*, 2011). Knowledge, attitude and practice scores have a practical effect upon patient's self-care behavior (Ghannadi *et al.*, 2016). Patient's active participation and adequate knowledge about their disease is the key to success in management of type 2 diabetes. Among geriatric patients, medication adherence and level of knowledge need to be assessed periodically (Omar *et al.*, 2014). Use of television, books and pamphlets for providing information to patients yielded a good number of positive outcomes. Benefits for patients can be maximized with the better understanding of use of these methods along with various novel approaches (Javalkar *et al.*, 2016).

Limitations

Few relevant studies might have missed in this systematic review due to the limited database search. Research studies published in English language only considered for the review which also might have missed few relevant studies. Other concern is that of varied sample size of the included studies which ranged between 52 participants to 5957 participants and there was heterogeneity in their approach.

Implication for practice

Education, creating awareness and practice of good self-care behaviours can be improved with specific interventions (Kassahun *et al.*, 2016). Better glycemic control was evident in people with diabetes who were aware of HbA1c level (Kumpatla *et al.*, 2010). As the attitude and knowledge has direct relationship with practice, improvement in knowledge may result in good practice thereby reduction in complications related to diabetes (Karbalaefifar *et al.*, 2016). Positive attitude towards reducing complications related to diabetes (Ahmed *et*

al., 2015) and good quality of self-management education program may be beneficial for type 2 diabetes patients (AlAboudi *et al.*).

Implication for research

Nurses play a very important role in care of diabetes patients, involving them in educational interventions for managing diabetes may yield good results (Waller *et al.*, 2010). Future research can focus on this aspect and can assess the effectiveness of novel educational interventions implemented through nursing professionals which may facilitate access to quality diabetes care.

Conclusion

On a whole, this systematic review stresses the importance of provision of quality diabetic education as an integral part of regular diabetes care to enhance knowledge of people with diabetes and translation of that knowledge into practice becomes crucial. Educational interventions work well in effective management of diabetes if it was provided in good quality and active participation of patients in diabetes management.

REFERENCES

- Aboudi, I.S., Hassali, M. A., & Shafie, A. A. 2017. Knowledge, attitudes and quality of life of type 2 diabetes patients in Riyadh, Saudi Arabia, 8(3), 195–202. <https://doi.org/10.4103/0975>
- Ahmed, M. U., Seriwala, H. M., Danish, S. H., Khan, A. M., Husain, M., Ahmed, M. M., & Anis, K. 2016. Knowledge, Attitude, and Self Care Practices Amongst Patients With Type 2 Diabetes in Pakistan, 8(7), 1–8. <https://doi.org/10.5539/gjhs.v8n7p1>
- Arden, G.J. R.A., Paz-pacheco E., Jimeno C. A., Lantion-ang, F. L., Juban N. 2017. Knowledge, attitudes and practices of persons with type 2 diabetes in a rural community : Phase I of the community-based Diabetes Self-Management Education, 90(2010), 160–166. <https://doi.org/10.1016/j.diabres.2010.08.003>
- Atak, N., Gurkan, T., Science, E., & Kose, K. (n.d.). The effect of education on knowledge, self management behaviours and self efficacy of patients with type 2 diabetes, 26(2), 66–75.
- Binh, T., Phuong P, Nhung B. 2015. Knowledge and associated factors towards type 2 diabetes among a rural population in the Red River Delta region, Vietnam. *Rural and Remote Health* ; 15: 3275. Available: <http://www.rrh.org.au/articles/subviewnew.asp?ArticleID=3275>
- Breen, C., Ryan, M., Gibney, M. J., & Shea, D. O. 2017. Diabetes-related nutrition knowledge and dietary intake among adults with type 2 diabetes British Journal of Nutrition, (2015), 439–447. <https://doi.org/10.1017/S0007114515002068>, doi:10.1016/S0140-6736(09)60937-5. Epub 2009.
- Fan, L., Sidani, S., Cooper-brathwaite, A., & Metcalfe, K. 2014. Improving Foot Self-Care and Behaviors in Patients With type 2 Diabetes at Low Risk for Foot Ulceration : A Pilot Study. <https://doi.org/10.1177/1054773813491282>
- Ghannadi, S., Amouzegar, A., Amiri, P., Karbalaefifar, R., Tahmasebinejad, Z., & Kazempour-ardebili, S. 2016. Evaluating the Effect of Knowledge, Attitude, and Practice

- on Self-Management in Type 2 Diabetic Patients on Dialysis, 2016.
- Gondal, M., Bano, U., Moin, S., & Afridi, Z. 2007. Original article evaluation of knowledge and practices of foot care in patients with chronic type 2 diabetes mellitus, 104–108.
- He, X., & Wharrad, H. J. 2007. Diabetes knowledge and glycemic control among Chinese people with type 2 diabetes, 280–288.
- IDF Clinical Guidelines Task Force 2005. Global Guideline for Type 2 Diabetes. Brussels: International Diabetes Federation.
- IDF Global score card Tracking Progress for Action 2014. Brussels, Belgium: International Diabetes Federation. www.idf.org
- International Diabetes Federation 2015. *IDF Diabetes Atlas, 7th edn*. Brussels, Belgium: International Diabetes Federation. <http://www.diabetesatlas.org>
- Islam, S.M.S, Niessen L. W., Seissler, J., Ferrari, U., & Biswas, T. 2015. Diabetes knowledge and glycemic control among patients with type 2 diabetes in Bangladesh. *SpringerPlus*. <https://doi.org/10.1186/s40064-015-1103-7>
- Jackson, I. L., Adibe, M. O., Okonta, M. J., & Ukwe, C. V. 2014. Knowledge of self-care among type 2 diabetes patients in two states of Nigeria, *12*(3), 1–10.
- Jinadasa, C.V. M., & Jeewantha M. 2011. A study to determine the knowledge and practice of foot care in patients with chronic diabetic ulcers, *3*(1), 115–123.
- Kandula, N. R., Nsiah-kumi, P. A., Makoul, G., Sager, J., Zei, C. P., Glass, S., ... Baker, D. W. 2009. Patient Education and Counseling The relationship between health literacy and knowledge improvement after a multimedia type 2 diabetes education program, *75*, 321–327. <https://doi.org/10.1016/j.pec.2009.04.001>
- Karbalaefar, R., Kazempour-ardebili, S., & Amiri, P. 2016. Evaluating the effect of knowledge, attitude and practice on self-management in patients with type 2 diabetes. *Acta Diabetologica*, *53*(6), 1015–1023. <https://doi.org/10.1007/s00592-016-0905-6>
- Kassahun, T., Gesesew, H., Mwanri, L., & Eshetie, T. 2016. Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: a cross-sectional survey. *BMC Endocrine Disorders*, 1–11. <https://doi.org/10.1186/s12902-016-0114-x>
- Khamseh, M. E., Vatankhah, N. & Reza, H. 2007. Knowledge and practice of foot care in Iranian people with type 2 diabetes, *4*(4).
- Kheir, N., Greer, W., Yousif, A., Al, H., & Al, R. 2011. Knowledge, attitude and practices of Qatari patients with type 2 diabetes mellitus, 185–191. <https://doi.org/10.1111/j.2042-7174.2011.00118.x>
- Kishore, J., Kohli C., Gupta, N., Kumar, N., & Sharma, P. K. 2017. Awareness, Practices and Treatment Seeking Behavior of Type 2 Diabetes Mellitus Patients in Delhi, *5*(4), 266–273. <https://doi.org/10.4103/2141>
- Ku, G. M. V., & Kegels, G. 2015. Knowledge, attitudes and perceptions of people with type 2 diabetes as related to self-management practices: Results of a cross-sectional study conducted in Luzon, Philippines. <https://doi.org/10.1177/1742395314538291>
- Kueh, Y. C., Morris, T., Borkoles, E., & Shee, H. 2015. Modelling of diabetes knowledge, attitudes, self-management, and quality of life: a cross-sectional study with an Australian sample. *Health and Quality of Life Outcomes*, 1–11. <https://doi.org/10.1186/s12955-015-0303-8>
- Kumapatla, S., Medempudi, S., Manoharan, D., & Viswanathan, V. 2010. Knowledge and Outcome Measure of HbA1c Testing in Asian Indian Patients with Type 2 Diabetes from a Tertiary Care Center, *35*(2), 290–293. <https://doi.org/10.4103/0970-0218.66858>
- Magurová, D., Majerníková, L., Hloch, S., Tozan, H., & Goztepe, K. 2012. Knowledge of diabetes in patients with type 2 diabetes on insulin therapy from eastern slovakia, 95–102.
- Mahon, A. M., Moore, G. D., Gazes, M. I., Chusid, E., & Macgilchrist, C. 2016. An Investigation of Diabetes Knowledge Levels Between Newly Diagnosed Type 2 Diabetes Patients in Galway, Ireland and New York, USA: A Cross-Sectional Study. <https://doi.org/10.1177/15347346166638775>
- Obirikorang, Y., Obirikorang, C., Anto, E. O., Acheampong, E., Batu, E. N., Stella, A. D., ... Brenya, P. K. 2016. Knowledge of complications of diabetes mellitus among patients visiting the diabetes clinic at Sampa Government Hospital, Ghana: a descriptive study. *BMC Public Health*, 1–8. <https://doi.org/10.1186/s12889-016-3311-7>
- Omar, M. S., & San, K. L. A. I. 2014. Innovare Academic Sciences Diabetes knowledge and medication adherence among geriatric patient with type 2 diabetes mellitus, *6*(3), 4–7.
- Perera, D. P., Silva, R. E. E. De, & Perera, W. L. S. P. 2013. Knowledge of diabetes among type 2 diabetes patients attending a primary health care clinic in Sri Lanka, *19*(7).
- Ramachandran, A., Ma RC, Snehalatha C. Diabetes in Asia. *Lancet*. 2010; *375*(9712):408-18.
- Rao, C. R., Kamath, V. G., Shetty, A., & Kamath, A. 2010. A study on the prevalence of type 2 diabetes in coastal Karnataka, *30*(2). <https://doi.org/10.4103/0973-3930.62597>
- Saleh, F., Mumu S. J., Ara F., Begum H. A., & Ali L. 2012. Knowledge and self-care practices regarding diabetes among newly diagnosed type 2 diabetics in Bangladesh: a cross-sectional study. *BMC Public Health*, *12*(1), 1. <https://doi.org/10.1186/1471-2458-12-1112>
- Shah, V. N., Kamdar, P. K., & Shah, N. 2017. Assessing the knowledge, attitudes and practice of type 2 diabetes among patients of Saurashtra region, Gujarat, *29*(3), 118–122. <https://doi.org/10.4103/0973>
- Shrestha, N., Sb, Y., Am, J., Bdp, P., Shrestha, J., & DI, B. (n.d.). Diabetes Knowledge and Associated Factors among Diabetes Patients in Central Nepal, *7*(5), 82–91.
- Smalls, B. L., Walker, R. J., Hernandez-tejada, M. A., Campbell, J. A., Davis, K. S., & Egede, L. E. 2013. NIH Public Access, *34*(4), 385–389. <https://doi.org/10.1016/j.genhosppsych.2012.03.018>. Associations
- Sweileh, W. M., Zyoud, S. H., Abu, R. J., Deleq, M. I., & Enaia, M. I. 2014. Influence of patients' disease knowledge and beliefs about medicines on medication adherence: findings from a cross-sectional survey among patients with type 2 diabetes mellitus in Palestine, 1–8.
- Waller, B., & Tzeng, H. 2010. Glycaemic index knowledge and use among African Americans with type 2 diabetes, 1102–1109. <https://doi.org/10.1111/j.1365-2648.2010.05534.x>
- Yang, S., Kong, W., Hsue, C., Fish, A. F., & Chen, Y. 2016. Knowledge of A1c Predicts Diabetes Self- Management and A1c Level among Chinese Patients with Type 2 Diabetes, 1–10. <https://doi.org/10.1371/journal.pone.0150753>