Unnes Journal of Public Health 11 (1) (2022)

Unnes Journal of Public Health

http://journal.unnes.ac.id/sju/index.php/ujph

Barriers to Understanding Health Education in Patients with Diabetes Mellitus (DM) in Yogyakarta: Qualitative Study

Mahendro Prasetyo Kusumo[1,2] ✉, Wiwik Kusumawati[3]

[1]Master of Hospital Administration, Postgraduate Program, Universitas Muhammadiyah Yogyakarta, Indonesia
[2]Departement of public Health, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Indonesia
[3]Departement of medical education, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Indonesia

Article Info

Article History
Submitted January 2021
Accepted July 2021
Published January 2022

Keywords:
Diabetes mellitus (DM), barriers to understanding, health education

DOI:
https://doi.org/10.15294/ujph.v11i1.43917

Abstract

Poor physical activity behavior has its roots in a lack of understanding of the importance of healthy living. This study explores health education barriers to controlling blood glucose in a patient with DM in primary health care. The Forum Group Discussion (n = 22) and interview (n = 5) methods were used to explore the patient's desire to overcome educational barriers. Informants for the study were patients with DM aged between 26-69 years from two community health centers and two private health centers within Sleman Regency, Indonesia. The informants were then questioned about barriers to physical activity programs for controlling blood glucose. The data collected was analyzed using Opencode, and the results revealed that boring educational training is the leading cause of physical inactivity and dietary control in patients with DM. Furthermore, the use of formal language in delivering material is the cause of patient boredom to take part in the training. Also, limited health human resources have resulted in a lack of maximum education programs for patients with DM in Yogyakarta. Therefore, a tense atmosphere and the use of complex language have a negative impact on patients to change physical activity and control eating patterns.

INTRODUCTION

Diabetes Mellitus (DM) is one of the chronic diseases and belongs to a global economic burden (World Health Organization, 2016). The government of Indonesia had conducted various DM control programs in 2013-2016 (Peraturan Presiden Republik Indonesia, 2013; Kementerian Kesehatan Republik Indonesia, 2014; Peraturan Kementrian Kesehatan, 2015; Kemenkes RI, 2017). However, the number of DM and its complications continue to increase. The most complications caused by DM are: chronic kidney failure, heart failure and diabetic ulcers

✉ Correspondence Address:
Master of Hospital Administration, Postgraduate Program, Universitas Muhammadiyah Yogyakarta, St. Brawijaya, Geblagan, Tamantirto, Kec. Kasihan, Bantul, Daerah Istimewa Yogyakarta 55183
E-mail: mahendro_prasetyo@umy.ac.id

Open Access
pISSN 2252-6781
eISSN 2548-7604

(Kementerian Kesehatan Republik Indonesia, 2018).

One strategy that can prevent complications is to practice a healthy lifestyle effectively and efficiently (National Institutes of Health, 2002; Hemmingsen et al., 2017). A healthy lifestyle recommended is to do physical activity and control diet regularly so that it can control blood glucose levels and HbA1c (Balk et al., 2015).

The three main factors that affect a person's success in physical activity are beliefs, social support, and barriers that arise. However, most patients don't understand the type, duration, frequency, and time for physical activity. They need guidance to implement a physical activity program (Ranasinghe et al., 2015; Smith et al., 2017). Obstacles that occur during physical activity also play a role in the successful control of patients with DM. Obstacles that often arise when doing physical activity are complaints of knee pain, wounds in the legs, and shortness of breath (Jancey et al., 2009; Ibeachu et al., 2019).

Indonesia's health coverage program, the National Health Insurance (JKN) program, is administered by the BPJS Kesehatan (Healthcare and Social Security Agency). Although the JKN is the health coverage program and BPJS is the agency, the term BPJS is loosely used to refer to the program. Given its wide coverage, mostly among the lower middle class, BPJS has faced several hiccups in its operation. The government has targeted that all Indonesians will have BPJS membership by 2019. The BPJS emphasizes at preventive health care rather than curative. Each member is assigned to a primary health care facility, which can be a community health center (Puskesmas) or family doctor. These facilities are expected to promote a healthy lifestyle to prevent sickness in the first place. The Indonesian government and BPJS Kesehatan formulate a Chronic Disease Care Program (Prolanis) for diabetes mellitus that aimed at controlling the glycemic status and the risk factors of macro and microvascular complications (Idris, 2014; Healthcare and Social Security Agency, 2014, 2019). However, in 2018 the data showed that the prevalence of DM in Indonesia has increased. In the Special Province of Yogyakarta (DIY), the prevalence of DM also experienced a significant increase, from 6.9% to 8.5% (Kementrian Kesehatan Republik Indonesia, 2018). Most of these patients with DM live in urban areas, namely Yogyakarta City and Sleman Regency. In Sleman Regency, the diagnosis of DM is the second most common after hypertension (Dinas Kesehatan Kabupaten Sleman, 2020). Poor knowledge, attitudes and behavior about the importance of controlling blood glucose in patients with DM cause to non-compliance with physical activity programs in Sleman Regency (Kusumo et al (2), 2020). Policies regarding facilities and infrastructure that haven't cause to the implementation of a good physical activity program. The aim of this study was to explore health education barriers to controlling blood glucose patient with DM in community health center.

METHOD

Qualitative methods were to explore educational barriers to changing physical activity behavior of patients with DM in primary health center, Sleman Regency, Indonesia.

The study was conducted from September to December 2019 at two community health center and two private health centers in Sleman Regency. The selection of informants was done by purposive technique. Investigators select informants based on medical record data and then meet patients when they come to the community health center or private health center. Interviews and FGDs were conducted for sixty to ninety minutes each.

This method provided complete questions from educational obstacles, barriers to physical activity, the material needed to support media. The investigators selected the participants using a purposive technique. The inclusion criteria of this study were patients with DM, diagnosed at least three months, aged 26-69 years, and did not use insulin therapy. The exclusion criteria for this study were patients with DM complications, cognitive impairment, and hearing loss. There were twenty-two FGD participants and five

Table 1. Object criteria

No	Object	Purpose	Method
1	Patients with DM (n=22)	To explore the barriers and desires of patients with DM to implement a regular physical activity program	FGD
2	Prolanis program leaders (n=2)	To explore the role of "Prolanis Program" leaders in coordinating health education, including barriers and solutions.	Indepth-interview
3	Doctor (n=2)	To explore the experience of doctors as educators in controlling blood glucose in patients with DM and the obstacles that are often complained of in implement physical activity programs and solutions.	Indepth-interview
4	Head of BPJS Sleman (n=1)	To explore the police related to prolanis program and future policy plans	Indepth-interview

interview participants. The purpose of qualitative data collection was to explore educational barriers and to change the behavior of physical activity of patients with DM in Sleman Regency, Indonesia. The steps of data collection were: (1). Focus group discussion (FGD) of patients with DM; (2). In-depth interviews with doctors; (3). Prolanis program leaders; and (4). Interviews with Head of BPJS Sleman.

The instruments used to measure variables were FGD guidelines for patients with DM, interview guides for doctors, "Prolanis program" leaders and Head of BPJS of Sleman regency (Kusumo et al. (3), 2021). The researchers developed the FGD guidelines and interviews from PERKENI guideline (Perkumpulan Endokrinologi Indonesia, 2015) and adjusted them according to the condition of patients with DM in Sleman Regency. The behavior experts, DM experts, and nutrition experts discussed the guidelines before being applied. There were 22 patients participated in this FGD (private health center n = 7 and community health center n = 15).

Participants came from the recommendations of the clinicians. During the FGD and interview, the participants didn't find any issues because researchers used simple questions. The FGD team consisted of facilitator, observer, secretary, and documentation team. The facilitators in the FGD were the main researchers, while the observers, note-takers, and documentation team were master students of public health science. The FGD began with an explanation of the objectives, flow, and signing of research-informed consent. The FGD process and interviews were led by the main researchers who were clinical doctors and researchers in the field of behavior, especially DM.

The investigator routinely attended DM management training from PERKENI and have become primary care doctors since 2011. Doctor in primary care conducted in-depth interviews. The doctor has received educational training and had experiences of providing educational training for at least one year.

Two persons in charge of the prolanis program were also included in-depth interviews. The investigator approached the informants by asking for permission and introducing himself to the patients. The informants then filled the informed consent voluntarily. All FGDs and interviews records were transcribed word-for-word by the researchers to avoid bias. FGD transcription data and interviews were analyzed qualitatively through a process of coding, categorizing, and finally determining the theme (Creswell & Clark, 2011). Qualitative data were processed through the Opencode application and discussed with informants for evaluation.

RESULT AND DISCUSION

In total, 27 informants consisted of 22 patients with DM (FGD participants) and 5 informants (doctors, prolanis, and BPJS managers). Most informants were women (n = 21) and between 46-65 years old (n = 21).

Based on qualitative data analysis, important coding causing the number of DM continues to increase. These essential codes are

Table 2. Demographic Data of the Informants

No	Location	Informants	Gender		Age (years old)			Occupations		
			M	F	17-25	26-45	46-65	Payee	Not Payee	Unemployed
1	Private Clinic	Patients	2	5	0	1	6	2	1	4
		Doctor	0	1	0	0	1	1	0	0
		Prolanis Program Manager	0	1	0	1	0	1	0	0
2	Public Clinic	Patients	3	12	0	2	13	3	2	10
		Doctor	0	1	0	0	1	1	0	0
		Prolanis Program Manager	0	1	0	1	0	1	0	0
3	BPJS	BPJS	1	0	0	1	0	1	0	0
TOTAL			6	21	0	6	21	10	3	14

Source: primary data

Table 3. Theme and initial coding framework

Theme (final coding framework)	Initial coding
Health barrier	Knee pain when physical exertion is too long
	Shortness of breath during physical activity
	Limp
	Being too heavy (overweight)
Barriers to educational training	Boring and patronizing
	Fear of asking
	No one taking the patients to the clinic
	Feeling busy
	Limited human resources
Knowledge barrier	Do not understand about DM prevention through physical activity
	Do not understand the type of exercise recommended
	Do not understand the recommended exercise frequency
	Do not understand the recommended exercise intensity
	Do not understand the recommended exercise times
Physical barrier	The weather is hot and rainy
	Facilities do not support
	Do not have sports equipment

Source: primary data

identified and then grouped into four domains that can be seen in tabel 2.

Health barrier

Feeling knee pain and shortness of breath becomes a barrier for patients to exercise or physical activity. The following is the statement from an informant:

> "I often experience knee pain and shortness of breath during strenuous physical activity. I'm afraid to do

it..."(Female, 44 years old, patient with DM)

"Sometimes I feel sluggish and have difficulty moving. the body is too heavy, too overweight..."(Female, 45 years old, DM patient)

Physical pain, such as knee pain, causes the patient not to be able to exercise or do physical activity. The following is the statement:

"If I exercise too long, I will have knee aches..." ((Female, 49 years old, doctor)

Barriers to educational training

In general, there are two obstacles to patients with DM. They are the difficulty of understanding the material and getting transportation. The patients feel that the education delivered often uses medical language (formal) so that patients feel bored and sleepy. The following is a statement from an informant:

"... For those who have been there for a long time, they must feel bored, because they have the education every month..."(B, DM patient, private health center)

Besides boring material, patients somehow are scared to ask. This problem also becomes an obstacle to receiving material delivered during education. The following is a statement from the informant:

"2-way communication, so it is more integrated and possible if people are shy to ask questions..." (E, DM patient, private health center)

Complicated language or terms to understand is also one of the obstacles to understanding the material. Patients expect educators/doctors to provide content with simple, relaxed, and humorous language as in everyday life. The following is a statement from the informant:

"Sometimes, if we talk to grandmothers, we don't speak Indonesian as they might not understand. Well, maybe by using their language, they will appreciate and feel interested"(Female, 49 years old, doctor)

The second factor is the presence of obstacles in the transportation of patients, especially elderly patients. Besides not having anyone who takes them to the clinic, the patient thinks that nothing is exciting to do in the education that causes feeling lazy, bored. The following is a statement from the informant:

"... Indeed, they have many other activities. Usually, the patients don't have anyone taking them to the clinic or their families do not allow them to go by themselves, so they do not come..."(Female, 53 years, doctor).

"…Indeed, they have many other activities. These elderly patients do not have anyone to take them to the clinic, or their families don't allow them to go by themselves. That is why they never attend the education..."(Female, 53 years, doctor).

"The human resources are unclear and lacking because there are

polyclinics everywhere. The government opens a lot of public health centers..."(Woman, 32 years, prolanis manager).

Knowledge barrier

Poor of knowledge about controlling blood glucose through physical activity is one of the obstacles in implementing a regular physical activity program. Patients with DM need a detailed explanation of the frequency, intensity, type, and time to do sports. The following is a statement from the informant:

"... most of the patients assumed that household chores were the same as exercise…"(49 years old, doctor).

"I don't understand the proper way of physical activity. I think doing household chores is enough to maintain health... "(Female, 32 years old, prolanis program manager)

Physical barrier

Facilities and weather don't support the majority of patients with DM sufferers to carry out physical activity as recommended. Hot weather makes them lazy to do physical activities, including the supports (sports shoes and clothes that absorb sweat). The following is a statement from the informant:

"…I'm lazy to walk far, afraid to sweat…"(Female, 50 years old, patient with DM)

"My feet get tired if the road is far, I prefer to park the car near the destination….(Female, 55 years old, patient with DM)

Lack of motivation is considered to be the main cause of barriers to physical activity. Motivation is an essential factor in physical activity as maintaining a long-term habit change requires motivation (Walker et al., 2018). Also, motivation is necessary for maintaining healthy lifestyle compliance (Greaves et al., 2011). So lack of motivation is often a reason for not doing physical activity (Lascar et al., 2014). The patients will feel motivated after they gain knowledge and experience to do activities physical (Walker, 2018).

They prefer to work and make money for the next day's living expenses. Nowadays, women have a greater responsibility because they are not only responsible at home but also, they can work. They must provide breakfast before all family members go to work or go to school (Lantara, 2015). Tight schedules often result in a lack of time for physical activity. However, the real problem is more about time management or the level of priority of someone who is less (Lascar et al., 2014).

The belief that physical activity can endanger the patient is also a barrier for patients to do it. They avoid activities that have the potential to cause additional pain or problems in themselves. Moreover, patients with DM report that they experience two times more muscle and bone pain than the average population (Lidegaard et al., 2016). Educational barriers experienced by patients with DM to receive education delivered include: (1). Boring and patronizing material; (2). Feeling shy to ask questions during educational procedures; and (3). Not having anyone to take the patients to the clinic, and 4) the patients' tight schedules. Also, in terms of human resources, a lack of resources is a problem. Patients feel sad about themselves and are less likely to exercise because of stigma words such as "obesity" and "fat" (Dickinson, 2018). This stigma sometimes arises due to the interpretation of the wrong medical language that causes patients to feel low satisfaction in health care (Bingham, 2018). Even patients also sometimes don't understand the contents of the information conveyed because it uses medical language (Engström et al., 2016). Thus, communication skills become essential in conducting education (Bingham, 2018).

The patients are afraid to ask even though they need the information (Engström et al., 2016). This fear causes patients to choose to read leaflets instead of asking (King et al., 2017). Another thing that inhibits education is the absence of patients. It may cause a lack of patient knowledge (Mikhael et al., 2019). Therefore, educational adaptation is necessary for patients with DM. For older adult patients, for example, adjustment can be made by simplifying educational material (Suhl & Bonsignore, 2006). Besides being simple, patients expect to get interesting and not dull material. The educators/doctors should deliver the content excitingly. For example, they should have confidence and communication skills to motivate patients to make changes (Svavarsdóttir et al., 2015).

The material that patient with DM expect covers a variety of bases regarding DM management. PERKENI's recommendations divide educational content into two parts, namely the initial and advanced level educational material. The difference lies in the location of providing education. At the initial level of education, primary health care only covers necessary DM management materials such as DM disease or foot cares, whereas advanced training contains slightly complicated stuff such as chronic complications for DM. This training exists in secondary or tertiary health services (Perkumpulan Endokrinologi Indonesia, 2015).

Most patients with DM want the use of pictures/caricature/ writing as educational media. Food models and videos can also be useful. This type of educational media belongs to visual aids tools (pictures, models, videos, real objects) to help facilitate the understanding of learning. The use of visual aids as one of the teaching methods stimulates the thinking process and improves the learning environment (Shabiralyani et al., 2015). Health education is a very important part in controlling DM. Education through the performing arts was effective in improving the attitude and practice in controlling blood glucose levels. This education is done based on the community by involving the patient's active role in exchanging opinions. Education through traditional arts has proven to be effective in increasing knowledge and practice. Patients can exchange experiences in controlling blood glucose based on their daily experiences. Based on this experience patients can increase motivation in participation to control blood glucose practice (Kusumo et al. (2), 2020).

This study noted the importance of considering environmental variables that may support or hinder physical activity behaviors throughout the year. Poor weather has been identified as an environmental barrier to being physically active, but to date, specific aspects of the weather/season have been highlighted as deterrents (Tucker & Gilliland, 2007). A large proportion of American adults delayed exercise in the summer and in the winter when faced with adverse weather conditions. In regions where sustained periods of uncomfortable weather and long seasons persist, it is necessary to offer indoor physical activity facilities so that participation can continue to take place (e.g. pools, gyms) (Tucker & Gilliland, 2007). Physicians and other professionals should be attuned to temperature or precipitation patterns in their community and be able to talk with patients about why they may not want to exercise when it is raining, snowing, or uncomfortably hot. Communities can work to create more weather-flexible and exercise-friendly neighborhoods with wider, cleaner sidewalks, well-maintained parks, and access to places for other activities like swimming and hiking that are appropriate for individuals from diverse subgroups of the population. Exploring how to limit exercise delays through the promotion of alternatives to outdoor exercise or by creating more exercise-friendly (Wagner et al., 2019).

CONCLUSION

The barriers to education felt by most people with DM are physical limitations, poor knowledge and practice, difficulty understanding health information conveyed by doctors and weather problems. Further research is needed to find out the details of exercise suitable for patients with DM in tropical countries.

ACKNOWLEDGEMENT

The authors would like to thank Universitas Muhammadiyah Yogyakarta, all patients with DM, Local Government, and Health Office of Sleman Regency. Thank you for your time, place, availability, and resources so that this research can be well conducted.

REFERENCES

Balk, E.M. et al. 2015. Combined Diet and Physical Activity Promotion Programs to Prevent Type 2 Diabetes among Persons at Increased Risk: A Systematic Review for the Community Preventive Services Task Force. *Annals of Internal Medicine*, 163 (6): 437. https://doi.org/10.7326/M15-0452.

Bingham, M. 2018. Timely News for the Multidisciplinary Care Team. *Diabetes*

Spectrum, 31 (4): 290–294. https://doi.org/10.2337/ds18-0061.

Creswell, J.W. & Clark, V.L.P. 2011. *Designing and Conducting Mixed Methods Research*. California: SAGE Publications.

Dickinson, J.K. 2018. The Experience of Diabetes-Related Language in Diabetes Care. *Diabetes Spectrum*, 31 (1): 58–64. https://doi.org/10.2337/ds16-0082.

Engström, M.S. et al. 2016. What is Important for You? A Qualitative Interview Study of Living with Diabetes and Experiences of Diabetes Care to Establish a Basis for a Tailored Patient-Reported Outcome Measure for the Swedish National Diabetes Register. *BMJ Open*, 6 (3): 1–9. https://doi.org/10.1136/bmjopen-2015-010249.

Greaves, C. et al. 2011. Systematic Review of Reviews of Intervention Components Associated with Increased Effectiveness in Dietary and Physical Activity Interventions. *BMC Public Health*, 11: 119. Available at: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=21333011.

Healthcare and Social Security Agency. 2014. *Panduan Praktis Edukasi Kesehatan (page 22)*. Jakarta: BPJS Kesehatan. https://bpjs-kesehatan.go.id/bpjs/arsip/detail/34

Hemmingsen, B. et al. 2017. Diet, Physical Activity or Both for Prevention or Delay of Type 2 Diabetes Mellitus and its Associated Complications in People at Increased Risk of Developing Type 2 Diabetes Mellitus. *Cochrane Database of Systematic Reviews,* 12. John Wiley & Sons, Ltd. https://doi.org/10.1002/14651858.CD003054.pub4.

Ibeachu, C., Selfe, J., Sutton, C.J. & Dey, P. 2019. Knee Problems are Common in Young Adults and Associated with Physical Activity and Not Obesity: the Findings of A Cross-Sectional Survey in A University Cohort. *BMC Musculoskeletal Disorders,* 20 (116): 1-7. https://doi.org/10.1186/s12891-019-2487-2

Idris, F. 2014. Pengintegrasian Program Preventif Penyakit Diabetes Melitus Tipe 2 PT Askes (Persero) ke Badan Penyelenggara Jaminan Sosial Kesehatan (BPJS Kesehatan) (The Integration of Prevention Program of Diabetes Mellitus type 2 PT Askes (Persero) into Health BPJS). *Journal of the Indonesia Medical Association*, 64 (3): 115–21. https://repository.unsri.ac.id/8848/.

Jancey, J.M. et al. 2009. Perceptions of Physical Activity by Older Adults: A Qualitative Study. *Health Education Journal*, 68 (3): 196–206. https://doi.org/10.1177/0017896909339531.

Kemenkes RI. 2017. Impelementasi Gerakan Masyarakat Hidup Sehat (Germas) dalam Rangka Mewujudkan ASN Sehat. Jakarta, Indonesia: Kementrian Kesehatan Republik Indonesia.

King, K.M. et al. 2017. Perceptions of Adolescent Patients of the "Lived Experience" of Type 1 Diabetes. *Diabetes Spectrum*, 30 (1): 23–35. https://doi.org/10.2337/ds15-0041.

Kusumo, M.P., Hendrartini, J., Sufro, Z.M. & Dewi, F.S.T. 2020. A Qualitative Study to Explore the Perception of Patients Towards Diet in Javanese Culture. *Enfermeria Clinica*, 30 (6): 183–187. https://doi.org/10.1016/j.enfcli.2020.06.041.

Kusumo, M.P., Hendrartini, J., Sufro, Z.M. & Tetra, F.S. 2020. Theater Performing Arts (TPA): Community Empowerment to Improve Blood Glucose Control Behavior in Yogyakarta. *International Journal of Endocrinology and Metabolism,* 18 (4): 1-7. https://doi.org/10.5812/ijem.103106.

Kusumo, M.P., Prabandari, Y.S. & Dewi, F.S.T. 2021. Measuring the Knowledge, Attitude and Practice of Patients with Diabetes Mellitus—The Design and Development Process. *International Quarterly of Community Health Education*. https://doi.org/10.1177/0272684x211022173.

Lantara, N. F. 2015. The Roles of Woman as Leader and Housewife. *Journal of Defense Management*, 5 (1): 1–5. https://doi.org/10.4172/2167-0374.1000125.

Lascar, N. et al. 2014. Attitudes and Barriers to Exercise in Adults with Type 1 Diabetes (T1DM) and How Best to Address Them: A Qualitative Study. *PLoS ONE*, 9 (9): 1-8. https://doi.org/10.1371/journal.pone.0108019.

Lidegaard, L.P. et al. 2016. Barriers to and Motivators for Physical Activity among People with Type 2 Diabetes: Patients' Perspectives'. *Diabetic Medicine*, 33 (12): 1677–1685. https://doi.org/10.1111/dme.13167.

Mikhael, E.M. et al. 2019. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy Dovepress Self-Management Knowledge and Practice of Type 2 Diabetes Mellitus Patients in Baghdad, Iraq: a Qualitative Study. *Diabetes,*

Metabolic Syndrome and Obesity: Targets and Therapy, 12: 1–17. https://doi.org/10.2147/DMSO.S183776.

National Institutes of Health. 2002. The Diabetes Prevention Program (DPP): Description of Lifestyle Intervention. *Diabetes Care*, 25 (12): 2165–2171. doi: 10.2337/diacare.25.12.2165.

Perkumpulan Endokrinologi Indonesia. 2015. *Konsensus Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 di Indonesia 2015*. Jakarta, Indonesia: PB. PERKENI. https://caiherang.com/wp-content/uploads/2019/10/Konsensus-DMT2-Perkeni-2015.pdf

Ranasinghe, P. et al. 2015. Knowledge and Perceptions about Diet and Physical Activity among Sri Lankan Adults with Diabetes Mellitus: a Qualitative Study. *BMC Public Health*, 15 (1): 1160. https://doi.org/10.1186/s12889-015-2518-3.

Shabiralyani, G. et al. 2015. Impact of Visual Aids in Enhancing the Learning Process Case. *Journal of Education and Practice*, 6 (19): 226–234. Available at: https://www.semanticscholar.org/paper/Impact-of-Visual-Aids-in-Enhancing-the-Learning-%3A-Shabiralyani-Hasan/32294f38a1d5b424de3540f91037039cc7873ade%0Awww.iiste.org.

Smith, G.L., Banting, L., Eime, R., O'Sullivan, G. & van Uffelen, J.G.Z. 2017. The Association between Social Support and Physical Activity in Older Adults: A Systematic Review. *International Journal of Behavioral Nutrition and Physical Activity,* 14 (56): 1-21. https://doi.org/10.1186/s12966-017-0509-8

Suhl, E. & Bonsignore P. 2006. Diabetes Self-Management Education for Older Adults: General Principles and Practical Application. *Diabetes Spectrum*, 19 (4): 234–240. Available at: http://athenaeum.libs.uga.edu/handle/10724/9567.

Svavarsdóttir, M.H., Sigurardóttir, Á.K. & Steinsbekk, A. 2015. How to Become an Expert Educator: A Qualitative Study on the View of Health Professionals with Experience in Patient Education Approaches to Teaching and Learning. *BMC Medical Education*, 15 (1): 1–9. https://doi.org/10.1186/s12909-015-0370-x.

Tucker, P. & Gilliland, J. 2007. The Effect of Season and Weather on Physical Activity : A Systematic Review. *Public Health,* 121 (12): 909–922. https://doi.org/10.1016/j.puhe.2007.04.009.

Wagner, A.L., Keusch, F., Yan, T. & Clarke, P.J. 2019. The Impact of Weather on Summer and Winter Exercise Behaviors. *Journal of Sport and Health Science,* 8 (1): 39–45. https://doi.org/10.1016/j.jshs.2016.07.007.

Walker, K.C., Valentiner, L.S. & Langberg, H. 2018. Motivational Factors for Initiating, Implementing, and Maintaining physical Activity Behavior Following a Rehabilitation Program for Patients with Type 2 Diabetes: a Longitudinal, Qualitative, Interview Study. *Patient Preference and Adherence*, 12: 145–152. https://doi.org/10.2147/PPA.S150008.

World Health Organization. 2016. *Global Report on Diabetes*. Geneva: WHO.