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An Overview of The Knowledge of People With Diabetes Mellitus About Diabetic Retinopathy: A Literature Review

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ABSTRACT
One of the complications of diabetes mellitus is diabetic retinopathy. The results of the research conducted to determine awareness and knowledge about diabetic retinopathy showed that awareness and knowledge about diabetic retinopathy were not satisfactory. Knowledge and awareness about diabetic retinopathy are needed to reduce visual disturbances due to diabetes mellitus. This research was a literature review using three databases, namely Google Sholar, PubMed, ProQuest, and Dimensions, and was published in 2017-2021. A total of 11 articles with a cross-sectional design met the criteria. The results show that the shortest duration of diabetes is one year, and the longest is >10 years, there are more male respondents than female respondents, and the age range is between 18-88 years. Knowledge related to diabetic retinopathy shows the poor result. Factors that influence knowledge are age, gender, religion, ethnicity, income, education level, occupation, marital status, diabetes duration, type of diabetes mellitus, patient perception, knowledge of systemic complications, and previous experience of visual impairment. Sources of information are from health staff, friends, or family of fellow sufferers and the media. Good knowledge is influenced by internal factors and external factors related to how to form a mindset and make decisions. The source of information obtained is used as a reference for knowledge and behavior formation. Providing education can be applied to increase patient knowledge about diabetic retinopathy.

KEYWORDS
Knowledge, diabetes mellitus, diabetic retinopathy

1. BACKGROUND

Uncontrolled diabetes will cause more severe damage to nerves or other vessels that are macrovascular and microvascular (Kurniawaty, 2014). Diabetic retinopathy is one of the most common microvascular complications in cases of diabetes mellitus (Dewi et al., 2016). By definition, diabetic retinopathy is a condition in which high sugar levels cause damage to the retinal blood vessels of the eye, especially the light-sensitive tissue. Symptoms that may appear in people with diabetic retinopathy are slowly decreasing vision, sudden loss of

vision, black spots floating in the field of vision, ghosting vision, impaired color vision, and pain in the eyes or red eyes (Ministry of Health of the Republic of Indonesia, 2018).

The risk factors for diabetic retinopathy are divided into two, namely, modifiable and non-modifiable factors. Modifiable factors include excess body weight, abdominal or central obesity, lack of physical activity, hypertension, dyslipidemia, unhealthy and unbalanced diet, and prediabetes. Meanwhile, factors that cannot be modified include race, ethnicity, age, gender, family history of diabetes mellitus, history of giving birth to a baby >4,000 grams, and history of birth with low birth weight (Data and Information Center of the Ministry of Health, 2020). Diabetic retinopathy is rare in children younger than 10 years, but the risk can increase after puberty (Erlvira & Suryawijaya, 2019).

According to the International Diabetes Federation, in 2019 there were 483 million people aged 20-79 years who had diabetes with a prevalence of 9% in women and 9.66% in men. The prevalence is expected to increase to 19.9% or 111.2 million people aged 65-79 years and will continue to increase to reach 578 million in 2030 and 700 million in 2045 (Center for Data and Information of the Ministry of Health, 2020). WHO explains that 1.5 million deaths occur due to diabetes. Diabetic retinopathy accounted for 1.9% of visual impairment and 2.6% of blindness in 2010 (World Health Organization, 2016). In 2015 accounted for 1.16% of visual impairment and 1.07% of blindness (Kemenkes RI, 2018). Indonesia is included in the top 10 countries with the highest number of sufferers in 2019 with 10, 7% of people with diabetes mellitus from the entire population of Indonesia. The prevalence of diabetes in Indonesia in 2013 found that 6.9% of the population suffered from diabetes mellitus. Basic health research in 2018 stated that the prevalence of diabetes mellitus in women was higher than in men. With a comparison of 1.78% for women and 1.21% for men (Center for Data and Information of the Ministry of Health, 2020). Complications of diabetes mellitus at RSCM in 2011 stated that neuropathy ranks first with 54% followed by diabetic retinopathy with 33.40%. According to research conducted by Corina in 2018, chronic complications in type 2 diabetes mellitus patients were diabetic neuropathy with 45%, diabetic nephropathy with 33.7%, and diabetic retinopathy with 20.7% (Data and Information Center of the Ministry of Health, 2014). The risk of developing diabetic retinopathy is directly proportional to the

duration of diabetes (Setyoputri et al., 2014). The mechanism of diabetic retinopathy is still unclear, but prolonged hyperglycemia can cause a progressive decrease in vision characterized by difficulty reading, blurred vision, and seeing halos or dark spots (Septadina, 2015).

Blood sugar levels that increase continuously for a long time activate the enzyme aldose reductase which functions to convert glucose into sorbitol. Sorbitol that accumulates in the capillaries increases the osmotic pressure which causes morphological abnormalities. Morphological abnormalities cause microaneurysms and blockage of blood vessels. Microaneurysms appear as small red dots scattered over the posterior retina that are sometimes surrounded by a ring of yellow lipid or exudate. The exudate here is the result of a vascular leak (American Academy of Ophthalmology, 2021).

Knowledge or cognition is a domain to shape one's actions through experience and research, a person's behavior based on knowledge will be more consistent than behavior that is not based on knowledge (Notoadmojo 2003 in Retnaningsih, 2016). Factors that influence knowledge include education level, information, culture, environment, experience, and age (Budiman & Riyanto 2013 in Retnaningsih, 2016). The prevalence of diabetic retinopathy increases with diabetes mellitus. Blood glucose levels, financial problems, patient education, and limited access to health services are the causes of an increase in diabetic retinopathy (Setyoputri et al., 2014). The lack of awareness to check themselves regarding the condition of their eyes regularly causes complications due to diabetic retinopathy to be rarely detected. Cooperation and commitment from various parties are needed to support eye health services for diabetic patients. The integration of the health system by all parties is needed in controlling diabetic retinopathy and reducing the overall rate of visual impairment (Zarisha, 2020). The results of the research conducted to determine awareness and knowledge about diabetic retinopathy showed that awareness and knowledge about diabetic retinopathy were not satisfactory. Knowledge and awareness of diabetic retinopathy are needed to reduce the burden of visual impairment caused by diabetes mellitus.

From the above background, it is known that the prevalence of microvascular complications of diabetes mellitus is still high, ranging from diabetic neuropathy, diabetic nephropathy, and diabetic

retinopathy. In addition to blood glucose levels, economic conditions, patient education, and limited access to health services are factors why the prevalence of diabetic retinopathy is still high. The severity of diabetes mellitus if left unchecked will cause diabetic retinopathy that is not detected and treated and will lead to blindness. Knowledge and awareness of people with diabetes mellitus related to diabetic retinopathy are needed to reduce the burden of visual impairment due to diabetes mellitus. To achieve control of the incidence of visual impairment, an integrated effort is needed by all parties between the community and health services.

2. METHODS

A national literature search using Google Scholar. Meanwhile, the international literature uses Pubmed, ProQuest, and Dimensions. The keywords used in the literature search reflect the PICO parameters that have been stated in the research question or during the formulation of the problem. Keywords and boolean operators are entered in the journal web which will be used as a source of literature searches.

The literature search uses the PRISMA flowchart which consists of 4 stages including identification, screening, and eligibility to the final stage, namely the determination of how many studies can be used as sources to be reviewed. The literature identification process starts by entering keywords in the database used, namely Google Sholar, PubMed, ProQuest, and Dimensions. So, if you add up, you will get 24,373 articles found from a search through the journal database. The next stage is screening or screening based on the title and year of publication, the articles taken are articles published in 2017-2021. From the screening stage according to the year of publication in 2017-2021, 8,316 were obtained. The next stage is filtering through titles, from 8.

Next is the eligibility process, namely checking articles based on abstracts to assess whether the literature used is appropriate. Eligibility was assessed based on the inclusion criteria in the study, namely: 1. Research on people with diabetes mellitus; 2. Fulltext accessible journals; 3. Explaining patient characteristics, knowledge of diabetic retinopathy, knowledge factors of diabetic retinopathy, and information related to diabetic retinopathy obtained from patients; 4. The literature was

reviewed using a cross-sectional study; 5. Indexed nationally or internationally; SINTA or SCIMAGO. Of the 22 articles after the feasibility test based on the inclusion criteria, 11 articles were found that matched. Then the 11 articles that fit the data were analyzed using the critical appraisal method.

Table 1. English Literature Keywords

Knowledge	Diabetic retinopathy	Diabetes mellitus
Knowledge OR Knowledge, Attitude, Practice OR Awareness	Diabetic retinopathy	Diabetes mellitus

Table 2. Keyword Indonesian Literature

Knowledge	Diabetic retinopathy	Diabetes mellitus
Knowledge OR Knowledge, Attitude, Practice OR Awareness	Diabetic retinopathy	Diabetes mellitus

Table 3. PICOS Pencarian Search Format

Criteria	Inclusion	Exclusion
Population or problem	Patients with diabetes mellitus.	Not people with diabetes mellitus.
Intervention	Given information or not related to diabetic retinopathy.	No exclusion
Comparison	Whether or not there is a comparison	No exclusion.
Results	Explaining the characteristics of the patient, knowledge of diabetic retinopathy, factors of knowledge of diabetic retinopathy, and information related to diabetic retinopathy obtained by the patient.	Does not explain about Explaining the characteristics of the patient, knowledge of diabetic retinopathy, factors of knowledge of diabetic retinopathy, and information related to diabetic retinopathy obtained by the patient.
Research design	*Cross-sectional study.*	Research design other than cross-sectional study.
Research publications	a. The year 2017-2021 b. Speak Indonesian or English c. Can be accessed in full text d. Indexed nationally or internationally; SINTA or SCIMAGO	a. Apart from 2017-2021 b. Other than Indonesian or English c. Cannot be accessed full text, d. Not indexed nationally or internationally; SINTA or SCIMAGO

3. RESULTS

Characteristics of Respondents from the Study

The entire literature obtained involved diabetes mellitus patients in various countries with the shortest duration of diabetes mellitus being 1 year and the longest duration being >10 years. From all the articles obtained, it is known that the youngest diabetic patient is 18 years old and the oldest is 88 years old. Of the 11 articles studied, 8 articles had a higher percentage of men. The education level of the respondents ranged from not attending school to the level of a professor.

Knowledge of Diabetics related to Diabetic Retinopathy.

Of all the articles studied, 4 articles explained that knowledge related to diabetic retinopathy was poor, 2 articles explained that knowledge related to diabetic retinopathy was good and 5 articles explained that respondents' awareness regarding diabetic retinopathy was good. This knowledge and awareness is in the form of complications of diabetes mellitus, such as the respondent's awareness of the effects of diabetes mellitus, how the signs and symptoms of diabetic retinopathy occur, risk factors that cause diabetic retinopathy, and treatment for diabetic retinopathy.

Factors Affecting Knowledge related to Diabetic Retinopathy.

Of the 11 articles studied, 10 articles explain the factors that influence the knowledge of people with diabetes mellitus related to diabetic retinopathy. Factors that influence the knowledge of people with diabetes mellitus about diabetic retinopathy include age, gender, religion, ethnicity, income level, education level, occupation, duration of diabetes mellitus, type of diabetes mellitus suffered, knowledge of systemic complications, and previous experience of visual impairment.

Sources of Information related to Diabetic Retinopathy

Of the 11 articles that can be analyzed, as many as 6 articles explain where the source of information related to diabetic retinopathy is obtained by people with diabetes mellitus. Sources of information for people with diabetes mellitus come from health staff such as general practitioners and ophthalmologists, social media, the internet, television, newspapers, magazines, books, and friends or family who suffer from diabetes mellitus.

4. DISCUSSION

Characteristics of Respondents

The entire literature obtained involved diabetes mellitus patients in various countries with the shortest duration of diabetes mellitus being 1 year and the longest duration being >10 years. From all the articles obtained, it is known that the youngest diabetic patient is 25 years old and the oldest is 80 years old. Of the 11 articles studied, 8 articles had a higher percentage of men. The education level of the respondents ranged from not attending school to the level of a professor.

Diabetes can strike anyone regardless of the patient's gender and age. In the research by Setiyo Nugroho & Musdalifah (2020) explained that there was no relationship between gender and the incidence of diabetes mellitus. The results of the research that has been finish, it is found that men have a higher percentage of diabetes than women. This is contrary to research conducted by Komariah & Rahayu (2020) state that more patients with diabetes mellitus are female. Women are more at risk for diabetes because of a greater increase in body mass index. Excess body mass index occurs when excessive energy consumption exceeds energy needs. Men have risk factors for diabetes if an unhealthy lifestyle is accompanied by smoking, drinking alcohol or caffeine, and not being balanced with exercise (Usman et al., 2020). In addition to factors related to an unhealthy lifestyle, men can be at risk of suffering from diabetes mellitus due to a lack of concern for self-examination regarding their condition.

Diabetes mellitus can attack anyone regardless of educational background. However, a study conducted by Heroes and Nugroho (2019) states that there is a relationship between the level of education with the incidence of diabetes mellitus. Where from 111 respondents consisting of 37 case samples and 74 control samples that have been tested using chi-square, based on the results of the crosstab stated that respondents with low education suffer from diabetes mellitus as many as 31 people. Educational background is an important factor that shapes the ability to understand disease management, one of which is diabetic retinopathy, and vice versa. This is in line with research that states that there is a relationship between education level and diabetes mellitus, it is stated that people with low education have a 4,895 times greater chance of developing diabetes mellitus (Heroes and Nugroho, 2019).

There is a relationship between age and diabetes mellitus where at the age of >45 years the risk is 18,143 times greater than that of patients aged <45. At the age of >45 years, the body's condition and function will decrease, this happens because of glucose intolerance due to decreased body function in metabolizing glucose and the long duration of diabetes mellitus. WHO explains that at age > 40 years, blood glucose levels will increase 1-2 mg% per year while fasting and increase to 5.6-13 mg% 2 hours after eating (Gunawan & Rahmawati, 2021). In addition to a decrease in body function at the age of >45 years, a person tends to be lazier to do activities. Lack of physical activity will make the body's secretory system run slowly resulting in the accumulation of fat in the body which gradually leads to diabetes mellitus. From all articles studied, the average duration of diabetes mellitus is 10 years. Hyperglycemia lasts a long time which if left uncontrolled will cause morphological disturbances and cell disorders. This is in accordance with the theory that excessive glucose levels for a long time can cause microvascular complications in the blood vessels, nerves, eyes, kidneys, and cardiovascular system. The duration of diabetes mellitus is more than 5 years and has a risk of 6 (Sahreni and Saputra, 2020).

Knowledge of people with diabetes mellitus about diabetic retinopathy.

Of all the articles studied, 4 articles explained that knowledge related to diabetic retinopathy was poor, 2 articles explained that knowledge related to diabetic retinopathy was good and 5 articles explained that respondents' awareness regarding diabetic retinopathy was good. This knowledge and awareness is in the form of complications of diabetes mellitus, such as the respondent's awareness of the effects of diabetes mellitus, how the signs and symptoms of diabetic retinopathy occur, risk factors that cause diabetic retinopathy, and treatment for diabetic retinopathy.

Poor knowledge related to sources of information related to diabetic retinopathy. In a study conducted by Alzahrani et al (2018), 36% of patients said that they did not know about diabetic retinopathy because their doctor did not explain it. Poor knowledge regarding access to information related to complications provided by health services These results are in line with research conducted by Heroes & Nugroho (2019) where there is a relationship between

knowledge and the incidence of disease in this case diabetes mellitus. Knowledge related to diabetes mellitus is obtained through health services, articles, television, or the internet Good knowledge is not just knowing but must understanding, applying, analyzing, and evaluating this knowledge.

Good knowledge in this study regarding complications of diabetes mellitus. Diabetes mellitus can cause vision problems, ranging from decreased vision, retinal damage, cataracts, and kidneys (Bakkar et al., 2017; Al-Yahya et al., 2020). Complications of diabetes mellitus are divided into macrovascular and microvascular complications. Lack of blood sugar control leads to complications such as diabetic neuropathy, coronary artery disease followed by heart disease, stroke, and sexual dysfunction (Khatib et al., 2021; Assem et al., 2020; Hamzeh et al., 2019; Alzahrani et al., 2018). Microvascular complications occur due to blockages in small blood vessels, causing sufferers to experience disturbances (Yuhelma et al., 2015). Diabetic retinopathy begins with decreased vision, sudden loss of vision, the presence of objects or spots in the visual field, ghosting of vision, impaired color vision, and eye pain. However, in some cases, these signs and symptoms do not appear. This is in accordance with the theory that excessive glucose levels for a long time can cause microvascular complications in the blood vessels, nerves, eyes, kidneys, and cardiovascular system.

Treatment for diabetic retinopathy in the form of regular blood sugar control, regular visits of diabetics with diabetes mellitus to ophthalmologists, and surgery are one of the treatments that can be done to minimize the development of diabetic retinopathy (Hamzeh et al., 2019 ; Al-Asbali et al., 2020). Regular blood sugar control for patients with diabetic retinopathy can be used as a reference for patients in managing their lifestyles. How to control daily food intake so that blood sugar does not exceed the limit and does not aggravate the condition. Risk factors for diabetic retinopathy include lack of blood sugar control, long duration of diabetes mellitus, hypertension, high body index mass, smoking, and pregnancy. (Assem et al., 2020). A laser is used as one of the treatments for advanced diabetic retinopathy, the laser is performed in a conscious state for about 30 minutes with the cumulative risk of severe vision loss in 6 years being reduced from 50% when treated. Patients with proliferative retinopathy who experience bleeding may undergo

vitrectomy surgery to restore vision by removing bleeding from the bleeding tissue (Heroes and Nugroho, 2019).

In this study, it was found that awareness about diabetic retinopathy in diabetics was good. Increasing a person's level of education affects awareness of a healthy lifestyle. This awareness is in the form of awareness to control blood sugar and awareness that diabetes mellitus can have an effect on the eyes. Research conducted by Tarius et al., (2021) shows results that there is a relationship between awareness and knowledge of dental students. A person's awareness is influenced by the knowledge gained. If someone is aware of a problem, then to solve the problem, knowledge is needed to solve the problem effectively and efficiently. Behavior that is formed from awareness and knowledge will be more easily adopted and accepted. In the process of adopting behavior, good knowledge and awareness are needed. Good knowledge will help in maintaining behavior so that it lasts longer. This is because the first step in shaping one's behavior is knowledge, good knowledge begins with awareness (Tarius et al., 2021).

Factors that influence the knowledge of people with diabetes mellitus about diabetic retinopathy.

A person's knowledge is influenced by several factors, namely internal factors, and external factors. Internal factors come from individuals ranging in age, and gender. While external factors or factors that come from outside the individual range from education, work, experience, sources of information, interests, environment, and socio-culture (Darsini et al., 2019). In the article studied, it was found several factors that influence the knowledge and awareness of people with diabetes mellitus about diabetic retinopathy, ranging from age, gender, education, occupation, insurance, duration of diabetes mellitus, physical activity, and eye diseases that have been suffered before.

In this study, the youngest diabetes mellitus patient was 18 years old and the oldest was 88 years old. Increasing a person's age is not only physical but also psychological. In essence, the older a person is, the more mature his way of thinking will be and the life experience gained makes someone who is old enough to have maturity in determining decisions in action. The information absorption capacity of someone who is old enough is wider and easier to accept so that the knowledge

obtained is better. This is in line with research conducted Martilova (2020) that respondents aged >17 years have better knowledge than respondents aged <17 years (Heroes and Nugroho, 2019). The duration of suffering from diabetes mellitus starts from 1 year to > 10 years, experience regarding previous illnesses plays an important role in adding information and experience about diabetes mellitus and its complications. The more experience related to the disease, the more unconsciously they will train how to deal with unexpected situations so that the severity of complications can be minimized. The experience gained in the past becomes a source of knowledge, because the more experience you get, the more knowledge you get (Darsini et al., 2019)

In this study, it was stated that men had the highest percentage in 8 articles. Gender plays a role in shaping knowledge and affects the size of the brain and how the mindset is formed. In men, the brain is bigger than women, in their mindset women use the right brain more so they can see things from several points of view, while men use stronger motor skills than women and make decisions without involving feelings. In the brain, there is a hormone hippocampus which serves to store memories so that women can process information quickly.

Other factors include education, work, and physical activity. Education affects a person in receiving information and getting used to thinking logically in dealing with a problem. Individuals with low education have the risk of not paying attention to their lifestyle and diet which can worsen the condition of diabetes mellitus and cause complications. Work can be an external factor because in the work environment one will get experience and knowledge directly or indirectly. For people with diabetes mellitus who work and have high incomes, access to information can be obtained from all directions, starting from the internet media, coworkers who suffer from diabetes mellitus, and access to good health services.

Information about diabetic retinopathy.

Information sources are a collection of facts that can be used to meet the information needs of the wider community. Information sources are collections of information based on categories in the form of libraries, magazines, newspapers, and websites that are useful for meeting information needs (Dance, 2019). Of the 11 articles studied, 6 articles contained sources of information about diabetic retinopathy,

starting from health workers, namely doctors, ophthalmologists, family or friends with diabetes mellitus, television, internet media, social media, magazines, newspapers, and books. This is in line with research conducted by Karina et al., (2019) Regarding the respondents' sources of information about awareness about diabetic retinopathy, the study stated that information was obtained from health workers, family or relatives, and the mass media. Health staff act as sources of information because health staff has a duty to educate patients. Education related to diabetic retinopathy should be given during the initial examination, this is done to detect as well as prevent the severity of complications of diabetes mellitus. Friends and family become sources of information because, in essence, a person is easier to receive information from friends and family than anyone else.

Information sources are used to disseminate news or to dig up information. Information from health staff, family, or friends who suffer from diabetes mellitus, television, internet media, social media, magazines, newspapers, and books will be processed through the five senses to produce knowledge. Good sources of information will increase knowledge. The research conducted by Yunus & Zakaria (2017) indicates that respondents have a good level of knowledge regarding COVID-19 and access information through television, social media, and newspapers. Sources of information are important for improving attitudes and shaping behavior. Sources of information have a positive effect and more information can affect a person's knowledge and awareness so that they behave in accordance with the knowledge they have (Rohmah, 2019).

5. CONCLUSION

Patients with diabetes mellitus range in age from 18 to 88 years. Men are the largest percentage who suffer from diabetes mellitus. The duration of diabetes mellitus is from 1 year to >10 years. The education level of the respondents ranged from not attending school to being a professor. Knowledge of diabetics regarding diabetic retinopathy is poor and awareness regarding diabetic retinopathy is good. This knowledge and awareness are related to diabetic retinopathy in the form of complications of diabetes mellitus, such as what is the awareness of respondents about the effects of diabetes mellitus, how the signs and symptoms of diabetic retinopathy occur, risk factors that cause diabetic

retinopathy, and treatment for diabetic retinopathy. This knowledge is influenced by several factors, including internal factors such as age and gender. While external factors are religion, ethnicity, income level, education level, occupation, marital status, duration of diabetes mellitus, type of diabetes mellitus suffered, patient perception, knowledge of systemic complications, and previous experience of visual impairment. Sources of information about diabetic retinopathy were obtained from health staff, media, and friends or family of fellow sufferers. A good source of information will be used as a reference for how a person's knowledge and behavior are. media and friends or family of fellow sufferers. A good source of information will be used as a reference for how a person's knowledge and behavior are. media and friends or family of fellow sufferers. A good source of information will be used as a reference for how a person's knowledge and behavior are.

AUTHOR CONTRIBUTIONS

Substantial contributions to conception, data collection, data analysis: Nailatul Habibah. Writing manuscript: Siswoyo & Nur Widayati.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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