Research Article

Challenges of Neuropathy Screening for Preventing Diabetic Foot Ulcers: Perspectives of Public Health Nurses in Indonesia

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Abstract. Foot ulcers are a complication of diabetes which reduce quality of life. This study aimed to explore the perspectives of public health nurses regarding obstacles to carrying out effective neuropathy screening practices to prevent diabetic foot ulcers in public health centers. A qualitative study with a phenomenological approach was carried out using in-depth interviews and focus group discussions. The results of this study indicated five key themes of challenges: 1) inadequate knowledge and lack of skills in neuropathy screening; 2) insufficiency of health facilities in primary health care services; 3) high workload and job demands; 4) lack of human resources; and 5) inaccessibility of health care services. The findings provided important information regarding the challenges and constraints of implementing neuropathy screening practices in community health centers. The public health nurses need to improve their capabilities in implementing neuropathy screening and need to negotiate with stakeholders for the implementation of this screening policy to prevent foot ulcers in patients with diabetes mellitus at the community level.

Keywords: challenges in neuropathy screening practice, foot ulcer, public health nurses, diabetes mellitus, qualitative study

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Published: 7 February 2022

Publishing services provided by Knowledge E

Selection and Peer-review under the responsibility of the IVCN Conference Committee.

1. Introduction

Diabetes mellitus become significant challenges and a significant health economic burden which required in continuum of medical care to reduce multifactorial risks beyond glycemic control [1]. International Diabetes Federation (IDF) estimated that 465 million people worldwide have been living with diabetes mellitus [2]. It was predicted to be 578 million people on 2030. In Indonesia, the prediction of diabetes mellitus incidence rising from 10.7 million people in 2019 to be 13,7 million people in 2030.

Uncontrolled diabetes mellitus could impact on Diabetic Peripheral Neuropathy (DPN). It impacts on peripheral nerve damage due to high blood sugar levels by

sending signals to the brain and other parts. Patients with diabetic neuropathy have lost sensitivity in the foot which led on risk of injury and foot amputation. World Health Organization (WHO) estimated that 60-70% of 347 million people worldwide have neuropathy symptoms [3]. In Indonesia, approximately of 16.2% diabetes mellitus developed diabetic foot ulcer and required for amputation. It was due to lack of information on diabetes complication and foot ulcer. A study reported the main complications of DM including neuropathy (13% - 78%), microvascular complications (16% - 53%) and diabetic foot ulcers range from 7.3% - 24% [4].

Chronic foot ulcers have seriously impact on patients' quality of life. Economically, it might have an impact on family income due to lacking of ability to carry out activities as usual and decreasing productivity at work. Furthermore, high of health cost could increase the burden for the health system because they have to undergo long term care [5]. A study estimated that $2.5 billion in the United States in Maintaining costs [6]. Patients with chronic foot ulcers generally have their ulcers reviewed and dressed regularly in the community by their general practitioner (GP) or public health nurse (PHN).

Management of Diabetic Peripheral Neuropathy (DPN) was crucial to prevent diabetic foot ulcer and amputation. The Ipswich Touch Test (IpTT) is a simple tool in basic services to screen for neuropathy in diabetic patients [7]. In Indonesia, diabetes management policies have been implemented starting from the basic level of service, namely the *Puskesmas*. Through the *Prolanis* program, screening for risks of non-communicable diseases, routine blood sugar checks, and health education were carried out [8]. Public Health Nurses (PHN) play a vital role in helping and screening neuropathy, providing appropriate tasks, in improving the capacity of patients and their family members in dealing with problems.

However, some obstacles faced in the field including lack of ability of health workers to identify neuropathy and the unavailability of standard tools and protocols for conducting neuropathy screening. Therefore, most diabetic patients visit health services with infected feet and smelly feet, as well as complicated for healing process [9]. A previous study reported that inadequate knowledge, heavy workload, and shortage of resource has led to poor practice among nurses on preventing pressure ulcer [10]. Another study also had been conducted in Indonesia found that lack of skill and workload among health care providers become the obstacles to maintain the blood glucose levels [8]. Generally, this study focused on diabetes self-management not for screening the diabetes neuropathy. Therefore, the fundamental goal to understand neuropathy screening from PHNs perspective needs to be explained, particularly among different

basic service institution in Indonesian. The study aimed to explore the perspective of public health nurses (PHN) regarding challenges or obstacles to effective neuropathy screening practice (NSP) in preventing diabetic foot ulcers in public health centers

2. Method

2.1. Study design and setting

A qualitative study with phenomenology approach was applied in this study to explore the challenges of PHN to implement the effective neuropathy screening practice (NSP) for preventing the foot ulcers. We conducted the in-depth interview and focus group discussion (FGD) to obtain the information from PHN. This study was conducted in 7 public health centres in Indonesia.

2.2. Informants

Twenty-one informants were purposively selected based on the inclusion criteria including: 1) public health nurses (PHN) who have been working in public health centres; 2) more than 1 year to responsible in *prolanis* program or non-communicable diseases; 3) willingness to participate in this study. The triangulation method was used to explore data from different viewpoints among PHN. The triangulation method is widely used in the qualitative study to imply an aggregation of data collection from different sources or different viewpoints of key informants to validate the findings' truth [11]. Also, multiple data collection methods can be used to gain a greater understanding of a particular phenomenon as well as the use of different perspectives among the researchers in data analysis

2.3. Data collection procedure

FGD and in-depth interview with open ended questionnaire were conducted based on interview guideline to elaborate the information from PHN. The interview guideline was validated by three experts. We conducted each in-depth interview within 60-90 minutes. Before conducting the interview, all informants were required to sign the informed consent and the confidentiality for privacy. All data were recorded and transcribed into answer sheet by the researcher.

The interview theme focused on challenges of PHN to implement the effective neuropathy screening practice (NSP) for preventing the foot ulcers. During interview process, the informants were given the opportunity to provide feedback which would then be clarified. The guideline interview was developed by the researcher based on the concept of prevention of diabetes foot ulcer and model of NSP. Each question was validated by three experts to ensure the validity content. The researcher modified the questions based on the comments from the expert. The pilot testing also was conducted among five health care providers.

The bracketing interviews was conducted prior to, during and following the data collection process to uncover theme that may hinder the researcher's ability to listen to respondents or trigger emotional responses in the researcher. It also was used to clarity the participants' experiences by exploring forgotten personal experiences

After transcribing the answer from the informant into answer sheet, the information from the different informant were triangulated by comparing the critical point. Two researchers conducted the consensus and extracted the findings to obtained the mean themes. In addressing the credibility, the researchers conducted the accurate picture of the phenomenon under scrutiny.

2.4. Data Analysis

The data obtained from the informants were transcribed and extracted from an audio recorder in the form of a textual script. After that, the data were grouped based on key themes and sub-themes. The content analysis was conducted to identify, analyses and decide based on the key theme of each answer given by the informant. The final stage of the data analysis process is categorizing all themes based on keywords from the results of the research team analysis (consensus agreement).

2.5. Ethical consideration

We provided informed consent to all participants who were willing to participate in this study. The Ethical Review Committee for Human Research, Esa Unggul University has approved this study. The permission letter from the Head of each community health centre was also obtained before conducting this study.

3. Results

3.1. Demographic characteristic

Twenty public health nurses (PHN) were recruited and interviewed. Fourteen of them were female with an average age of 39 (SD = 1.52) years old. Most of the PHNs were female with five of them having completed a bachelor in nursing science, while the other fifteen completed a diploma degree in nursing. The PHNs had been working in the diabetes care unit and non-communicable diseases (NCD) at a community health center for an average of more than 6 years.

3.2. Challenges or obstacles to effective neuropathy screening practice

Following the perspective of public health nurses (PHN) regarding challenges or obstacles to effective neuropathy screening practice (NSP) in preventing diabetic foot ulcers in public health centers were systematically described as follows:

3.2.1. Inadequate knowledge and lack of skill on screening peripheral neuropathy

Sufficient knowledge and skills on screening neuropathy should be possessed by PHN who responsible in basic services. It was crucial aspect to carry out health programs effectively. In this study found that an informant did not understand regarding the diabetes complication such as neuropathy or the symptoms caused by the presence of neuropathy. He thought that pain or tingling in the legs is a symptom of high levels of uric acid or cholesterol. Another PHN said that the foot examination on a patient with diabetes mellitus had been conducted but he did not know the purpose of the foot examination.

It was in line with another PHN mentioned that routine health centers only check blood sugar and have never had any examination or socialization related to neuropathy. Information from other PHNs also said that they did not fully understand regarding the diabetes complications and neuropathy screening process. He also has not received any socialization while in charge of the non-communicable diseases program.

“Nothing understands on diabetes neuropathy, misunderstanding on neuropathy symptoms” (PHN-1, Male, 37-years-old).

"Ever to conduct the foot assessment in community health centers, but I do not understand the goals" (PHN-3, Male, 42-years-old)

"There is not socialization on screening neuropathy at community health centers (PHN-6, Female, 40-years-old)

"Not clear information and lack of experience on screening neuropathy" (PHN-5, Male, 37-years-old)

3.2.2. Insufficient of neuropathy screening equipment and health facility in primary health care services

An availability of neuropathy screening equipment and health facility at basic services centres has an important role for diabetes patients to access the health care services. The results of the FGD showed that an availability of neuropathy screening equipment and other health facilities were still insufficient especially for screening neuropathy and checking the blood glucose level. It became an obstacle among PHN who worked in basic services. Apart from that, other PHNs also said that some patients lacked of interest to come in public health center since there were not examination facilities, therefore, patients had to go home without doing the examination as planned.

"Insufficiency of stick supply for testing blood glucose and no neuropathy screening equipment at community health centres" *(PHN-5, Male, 37-years-old).*

"Lack of equipment for checking, difficult to do without monofilament test" (PHN-4, Male, 37-years-old)

"Lack of equipment, Public Health Office only supplied the stick without neuropathy equipment" (PHN-1, Male, 37-years-old)

3.2.3. High workload and job demand

The high workload and job demand were obstacles or challenges among PHN who worked in basic services. Some of them confirmed that they should responsible for more than one program in the public health centre. A public health nurse mentioned that apart from being responsible for the non-communicable disease program, he also should serve as an executive nurse by following a set shift schedule. The roles of the

executive coordinator to manage the inpatient service process, it was also necessary to arrange ship schedules and resolve problems found in the service process.

"not only responsibility on one program but I should responsibility on taking care patients. I should follow the shift schedule for taking care patients" (PHN-1, Male, 37-years-old)

"I responsibility on non-communicable diseases. I also serve as the coordinator of implementing nurses". I have to manage the inpatient service process, arrange the nurse shift schedule and be responsible for solving problems found in the service process" (PHN-3, Male, 42-years-old)

3.2.4. Insufficient human resources

Health care provider (HCP) has a strategic role in implementing health programs carried out at public health center. Lack of human resources in a health service has an impact on the quality of service. In this study, it was found that some of PHN have to be responsible for more than one program in the public health center. Therefore, they should manage time in carrying out the duties. Another PHN mentioned that, she could not focus on main duties since she has to carry out tasks simultaneously due to the lack of health personnel in public health center.

"not enough health care provider who responsible in non-communicable disease unit" (PHN-1, Male, 37-years-old).

"Inadequate human resource in community health centers, I should responsible more than one program" (PHN-2, Female, 37-years-old)

"In a inpatient services, a shortage of personnel was occurred" (PHN-5, Male, 37-years-old)

3.2.5. Inaccessibility of health care services

Inaccessibility of health services is another obstacle faced by PHN for implementation of routine program at the public health center. One PHN revealed that he had difficulty accessing information from patients because some of patients difficult to understand the information from PHN. In addition, some of PHNs also the loss of communication was due to them living in remote areas and not having communication tools. Therefore,

Table 1: Obstacle to screen diabetic neuropathy among PHNs

Categories of themes	
Inadequate knowledge and lack of skill on screening peripheral neuropathy	Misconception on neuropathy symptoms Lack of skill on screening neuropathy symptom
Insufficient of neuropathy screening equipment and health facility in primary health care services	Lack of monofilament testing in the primary care Limited of blood glucose testing
High workload and job demand	Double responsibility in the community health centre
Insufficient of human resources	Shortage of HCPs Imbalance distribution of HCPs
Inaccessibility of health care services	Lost follow-up patients

difficulties of carry out and follow-up programs found among them. Another PHN also said that some patients gave inactive cellphone numbers, thereby making it difficult for nurses to carry out the follow-up program.

4. Discussion

Through our findings, the researchers identified some barriers and challenges and how those barriers undermine the efforts of PHNs to implement the effective Neuropathic Screening Practice (NSP) in Preventing Diabetic Foot Ulcer (DFU). The researchers found that some barriers and challenges among PHNs to implement the effective Neuropathic Screening Practice, including inadequate knowledge and lack of skill on screening peripheral neuropathy, insufficient of neuropathy screening equipment and health facility in primary health care services, High workload and job demand, insufficient of human resources, and inaccessibility of health care services.

Adequate knowledge and skill on screening peripheral neuropathy are crucial aspects for PHNs to manage and prevent diabetes complications. The PHNs with adequate knowledge and skill on how to prevent complications could early detect neuropathy symptoms and recognize the action plan in foot ulcer prevention. A similar finding in a previous study mentioned that Lack of health information was associated with misconception in diabetes management [12]. One of study was conducted in Turkey reported that 66% of the healthcare provider did not receive training in diabetic foot care, 80.9% did not educate patients with diabetic foot problems, and 77.5% did not perform foot examinations on diabetic patients [13]. Although, PHNs have crucial aspects to prevent foot ulcer. Another study also confirmed that lack of knowledge and skill among PHNs could impact on quality of health care services [13, 14]. Some evidence

also reported that sufficient knowledge on diabetes management was associated with perceived barriers in blood glucose monitoring [15], and medication adherence [16].

Adequate health service facilities are one of the benchmarks for the quality of health services at public health centre. Through the focus group discussion (FGD) process, it was found that there was still a lack of neuropathy examination facilities available for basic services in Indonesia. A previous study revealed that higher prevalence of diabetic peripheral neuropathy due to instrument limitation [17]. Another study also reported that toe-brachial index was not affordable in the community for screening the diabetic peripheral neuropathy [18]. Therefore, the PHNs in the primary care setting needs to provide early detection of diabetic peripheral neuropathy using a simple and non-invasive screening tools. A study from Sendi et al. also stated that the availability of adequate facilities and infrastructure could show the quality of health care services [19].

Healthcare providers have essential roles in screening diabetic peripheral neuropathy among uncontrolled diabetes. Through the in-depth interview found that average working hours of PHNs in the community health centres were 8–10 h per day [8]. PHNs also reported that they needed to do administrative work and to provide care for approximately eight hours for hospitalized patients. A previous study mentioned that one of the significant constraints toward screening the diabetic peripheral neuropathy in the community health centres was high workload [20]. A study was conducted in China showed a significant relationship between the availability of health workers and sustainable of diabetes monitoring [21].

Sufficient of human resources in the primary healthcare is crucial aspects to improve the quality of healthcare services and effectively patient-centred services. An adequate human resources in health sector was increasingly recognized with a particular focus on scopes of practice among staff and human resources management for robust health care delivery. Conversely, insufficient of human resources in the primary health care often provide incomprehensive primary care services. Previous study mentioned that shortage manpower and declining strength of regular staff in the primary healthcare led to conflicts and demotivation among health care providers [22]. A study also reported that challenge of shortage manpower are hindrance in achieving the health related goals [23]. Another study confirmed that high workload of nurses were associated with 7% of failure to rescue [24]. Another study also confirmed that low quality of healthcare service and low capacity among HCPs were closely associated with shortages of HCPs [25].

Monitoring program was important to control health development among patients. Currently, most monitoring program is carried out by involving patients and families through social media. The results of this study found that some of PHNs have difficulties for monitoring patients, especially patients over 65 years since they did not understand how to operate the social media. Other PHN also mentioned that some of patients provided inactive phone number, therefore, making it difficult to contact them. A study was conducted by Jin et al. mentioned that a regular monitoring from PHN until patients return home could improve patients' recovery [21]. In addition, other studies revealed that effective monitoring could reduce the occurrence of complications and secondary diseases due to diabetes mellitus [16, 26].

5. Conclusion

The results of this study found some challenges faced by public health nursing (PHN) at public health center in early detection and prevention of complications of diabetes mellitus, especially neuropathy. This study involved 3 basic services that have non communicable disease and *prolanis* programs. Data were obtained through interviews and FGDs so that the results of the lack of knowledge and skills of health workers, inadequate facilities, workload of health workers, lack of human resources and difficulty in accessing health workers to patients.

Funding Research

This study was granted by *RISTEK-BRIN*, Republic of Indonesia, grant number: 234/SP2H/LT/DRP

Acknowledgments

We would like to thank to the all-public health nurses (PHNs) for valuable information related to diabetic neuropathy screening. We also thank for Esa Unggul University and Ministry of Higher Education and Research, Republic of Indonesia for supporting this research.

Conflict of interest

The authors declared there is no conflict of interest for writing and publishing the article

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