

# Prevention and control of diabetes mellitus complications in productive population in rural

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## ABSTRACT

In Pekalongan Regency, Central Java, Indonesia, cases of productive population with diabetes mellitus have rapidly increased over the past three years. With regard to individual-based problems prevention and management, this is not sufficiently balanced. From the standpoint of the provider, this study examines attempts to prevent and control diabetes mellitus in productive population, including obstacles and limitations. With a focus on three rural areas (Wiradesa, Tirta I and Kedungwuni I Sub-Districts), qualitative study included 75 productive-age diabetics and 30 breadwinners. In-depth interviews and focus group discussions were used to gather data, which was then thematically analyzed. Three rural locus with the highest prevalence of diabetes mellitus in productive population were found in the results. Through screening for non-communicable diseases at integrated service post (*Posyandu*), chronic disease management programs and cross-sectoral activities, there are numerous initiatives for the prevention and management of complications. The challenges include constantly changing programmers, programmers with many assignments, inadequate target awareness and low motivation, as well as a worse recording and reporting system. Such that fundamental information on both individual and public health cannot be accessed. Based on individual emphasis, recording and reporting, several programs for complication prevention and management are required to identify the range of non-communicable diseases.

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## 1. INTRODUCTION

An increase in cases of diabetes mellitus at productive population occurs in several rural areas in the world [1], [2]. As well as in Pekalongan Regency, Central Java, Indonesia in the last three years it has increased sharply. There were findings of 12,287 cases of diabetes mellitus of productive population in Pekalongan Regency where 2.2% of them were aged 15 years and over [3].

Research on knowledge, attitudes, and practices of diabetes, hypertension, and diabetic retinopathy and the factors that motivate diabetes and diabetic retinopathy screening in an eye health care pyramid model found that people with diabetes have a mean score of knowledge and attitudes higher about diabetes mellitus (DM), compared to those with diabetes non-sufferers, but it also has a higher level of consciousness. Most of the participants knew well about diabetes mellitus and hypertension but only a few knew that diabetes mellitus and hypertension could affect the eyes or be related to complications of diabetes [4]. This shows that most people

with diabetes mellitus have adequate knowledge about diabetes mellitus but do not have adequate knowledge about the complications and health problems that will arise in the development of diabetes mellitus [5], [6].

Prevention and management complications of diabetes mellitus requires encouragement within the sufferer himself to carry out strong self-care management [7], [8] because this condition is chronic and requires high discipline to comply with complications prevention programs such as adherence to oral therapy, dietary management and stress management so that quality of life productive population diabetics are maintained [9]–[13]. Good self-efficacy is needed for people with diabetes mellitus so they can apply self-care management in their daily activities [14]–[17]. Research on the level of self-efficacy among patients with type 2 diabetes who live in rural areas found that diabetic patients who live in rural areas have a moderate level of self-efficacy. Female and unemployed patients, and those with low levels of education, who spend their lives in villages and receive no training in disease management are risk groups in terms of self-efficacy [18]–[20].

Various programs for the prevention and control of diabetes mellitus complications have been implemented, including through oral therapy, providing physical activity interventions such as diabetes exercise, health education, and others. However, the intervention program for prevention and control of complications often experiences problems with low target participation because there is no trigger from the participants to follow the intervention program properly. In the context of rural communities, interventions to prevent and control complications of diabetes mellitus in productive population are carried out in collaboration between health providers and health cadres who help voluntarily through community-based health efforts. Cadres have a role in facilitating productive population diabetes mellitus sufferers who participate in intervention programs as messengers of health messages, reminding them to comply with taking medication and providing information on schedules for implementing interventions.

This study aimed to examine programs prevention and control complications diabetes mellitus of productive population. More correctly, in the context of rural communities to explore variations programs, supporting and enabling factors, barriers and constraints of the program. So that more comprehensive recommendations for intervention programs for prevention and control complications diabetes mellitus of productive population can be produced and appropriate in the context of a rural community in Pekalongan District, Central Java, Indonesia.

## 2. METHOD

This research design used qualitative research with a case study approach [15]–[22], with a research focus on the implementation of programs for the prevention and control complications of diabetes mellitus in productive population including variations program, supporting and driving factors, program barriers and constraints. Research informants involved providers holding non-communicable disease control programs and people with diabetes mellitus of productive population in three locus areas that had the highest prevalence of diabetes mellitus of productive population in Pekalongan Regency. The inclusion criteria for people with diabetes mellitus of productive population are age 31-82 years with an average age of 51 years.

### 2.1. Data collection

Data collection used in-depth interviews and focus group discussions using interview guidelines and focus group discussion guidelines. Three rural areas were determined as research locus through regional purposive sampling [23], [24], which had the highest prevalence of diabetes mellitus of productive population in Pekalongan Regency. The research informants included the head of the prevention and control of non-communicable diseases at the Pekalongan district health office, officers and implementors of the non-communicable disease prevention and control program at the community health center in Wiradesa sub-district, Tirto I sub-district and Kedungwuni I sub-district, and survivors of diabetes mellitus of productive population in three research sites. Recruitment of key provider informants by calling via telephone and WhatsApp at the Pekalongan district health office and three selected community health centers, then conducting in-depth interviews with a duration of 45-75 minutes for each informant. The question items include: mapping of areas with the highest prevalence of diabetes mellitus, variations of intervention programs that have been implemented include prolanis (management program for chronic diabetes mellitus disease and Hypertension) and integrated development post for non-communicable diseases (*Posbindu PTM*), program driving factors and obstacles to programs for prevention and control of complications of diabetes mellitus in productive population in Pekalongan Regency. Validity and reliability testing in this research was carried out by conducting member checks and peer checking, the researcher participated directly to ensure credibility, dependability was carried out by checking the interview script, apart from that, triangulation of sources was also carried out to ensure the confirmability of the research results. In Table 1, the characteristics of research informants who participated in in-depth interviews and focus group discussions are presented.

Table 1. Characteristics of informants who participated in in-depth interviews and focus group discussion (FGD)

Characteristics	In-depth interview	FGD
Gender		
Male	14	14
Female	20	27
Age		
18-24	9	13
25-44	10	13
45-69	15	15
Domicile		
Wiradesa	17	14
Tirto I	12	11
Kedungwuni I	5	16

Triangulation informants consisted of 75 participants, they are survivor's diabetes mellitus of productive population at three research locations, and health cadres in the area. Recruitment of triangulation informants was assisted by program implementors and health cadres who were on duty at the three research locations. They were contacted via WhatsApp and a WhatsApp group was created to facilitate coordination and research implementation. Then a focus group discussion was conducted to examine information on perceived barriers to implementation of the intervention and what driving factors were owned to be able to adopt an intervention program for the prevention and control of complications of diabetes mellitus at a productive population [25]–[27].

## 2.2. Data analysis

Data analysis using thematic analysis [23], [28], [29]. Data were analyzed using a thematic analysis approach [30], [31], by specifying coding [32], [33], make a similar patterns (pattern mathing), drawing and make major deductions [34], [35]. Peer-d briefings were also conducted to maintain the consistency of the informant's answers [36]. This research is based on the phenomenology that there are three villages that have the highest cases of diabetes mellitus in Pekalongan Regency. In addition, the socio-demographic picture in the three villages is very supportive considering the characteristics of the productive population of people with diabetes mellitus and providers to explore implementation programs. Saturation in qualitative studies is carried out when the answers from informants are saturated or conditions when all informants answer in the same pattern [24], [31]. This research was approved by the research ethics committee of the Faculty of Medicine, Universitas Sebelas Maret with number 99/UN27.06.11/KEP/EC/2022.

## 3. RESULTS AND DISCUSSION

Based on the results of in-depth interviews with the head of the disease prevention and control section of the Pekalongan District Health Office, it was found that the mapping of work areas with the highest prevalence diabetes mellitus of productive population was found in three locus, Wiradesa District (1,180 cases), Tirto I District (1,176 cases) and Kedungwuni I subdistrict (1,112 cases). Programs that have been implemented by the P2P section of the Pekalongan District Health Office related to efforts prevent and treat complications of diabetes mellitus in productive population are carried out through four health service approach, preventive, promotive, curative and rehabilitative, including activities Screening, prolanis (management program for chronic diabetes mellitus disease and Hypertension) and integrated development post for non-communicable diseases (*Posbindu* PTM), while curative and rehabilitative efforts are carried out by referring diabetes mellitus sufferers of productive population who are already at the stage of continuing complications to Kajen Hospital and Kraton Hospital, Pekalongan Regency.

Screening is carried out at *Posbindu* PTM with a schedule of once a month per *posbindu* by the village/cadre accompanied by a public health center (*puskesmas*) officer, in the form of activities: measuring blood pressure, blood sugar levels, weighing, counseling, and screening for sensory disorders with the target being people aged 15 years and over. Prolanis is carried out once a month per group of *puskesmas* with the target of diabetes mellitus and hypertension patients who are referred back from the hospital, in the form of health check-ups, joint exercise, counseling, and medication monitoring.

Cross-sectoral efforts related to the prevention and control of non-communicable diseases (NCDs) at the Pekalongan District health office are carried out through screening activities for school children's risk factors, through weighing activities, measuring bodymass index (BMI), obesity, measuring height and weight, these efforts are carried out in collaboration with the education office from elementary to high school levels, in addition to that, youth integrated service posts (*posyandu*) activities were also carried out (in three

schools: Karanganyar Muhammadiyah Vocational School, Nahdlotul Ulama Kesesi Vocational School, and Kajen 1 High School. Equipment used in an effort to screen risk factors with collaboration cross-sectoral is an early detection kit (glukose blood measurement tool, BMI, hearing loss, vision, health disorder screening). Cross-program efforts are carried out with the health promotion section at the Pekalongan district health office in the form of providing counseling to motivate people with diabetes mellitus of productive population to come and take part in *Posbindu PTM* activities (which consist of 5 desk activities) targeting people aged 15-59 years, if there are sufferers aged over 60 years, then included in the *posyandu* data collection for the elderly. Theme 1 Regional mapping with the highest prevalence of diabetes mellitus in productive population in Pekalongan Regency.

*“The 3 areas with the highest prevalence of diabetes mellitus in productive population in Pekalongan Regency are: Wiradesa District (1,180 cases), Tirta I District (1,176 cases) and Kedungwuni I District (1,112 cases).”* (Head of section on prevention and control of non-communicable diseases)

Theme 2 The program that has been implemented by the Pekalongan District Health Service is related to efforts to reduce cases of diabetes mellitus. These efforts include preventive, promotive, curative and rehabilitative efforts. Apart from that, it also explores the efforts carried out at the health service, community health centers and hospitals.

*“The answers of program informants that have been carried out by the P2P section of the Pekalongan District Health Office related to efforts to prevent and treat complications of diabetes mellitus in productive population are carried out through a 4 health service approach, namely preventive, promotive, curative and rehabilitative, including activities such as screening, prolanis (management program DM chronic disease and hypertension) and Posbindu PTM (Integrated Development Post for non-communicable diseases, while curative and rehabilitative efforts are carried out by referring DM sufferers of productive population who are already at the stage of continuing complications to Kajen Hospital and Kraton Hospital, Pekalongan Regency. Screening is carried out at Posbindu PTM with a schedule once a month per posbindu by the village/cadre accompanied by puskesmas officers, with the form of activities: measuring blood pressure, blood sugar levels, weighing, counseling, and screening for sensory disorders targeting people aged 15 years and over Prolanis is held 1 month to once per group of puskesmas with the target of DM and hypertension patients who are referred back from the hospital, in the form of health check-ups, joint exercise, counseling, and monitoring of treatment.”* (Provider implementor of non-communicable disease prevention and control programs)

Theme 3 Cross-sectoral programs related to reducing diabetes mellitus in productive population.

*“Cross-sectoral efforts related to the prevention and control of NCDs at the Pekalongan Regency Health Office are carried out through screening activities for school children's risk factors, through weighing activities, measuring BodyMass Index, obesity, measuring height and weight, this effort is carried out in collaboration with the education office from elementary to high school, in addition to that, youth posyanduactivities were also carried out (in three schools, Karanganyar Muhammadiyah Vocational School, Nahdlotul UlamaKesesi Vocational School, and Kajen 1 High School. Equipment used in the effort to screen factors The risk with cross-sectional cooperation is early detection kits (glucosa blood measurement tools, BMI, hearing loss, vision, disorder screening &health questionnaires). Cross-program efforts are carried out with the health promotion section at the Pekalongan district health office in the form of providing counseling to motivate diabetes mellitus sufferers of childbearing age to come and take part in Posbindu PTM activities (which consist of 5 tables of activities) targeting people aged 15-59 years, if there are sufferers aged over 60 years, then they are included in the posyandu data collection for the elderly.”* (Provider implementor of non-communicable disease prevention and control programs)

Theme 4 Obstacles to the prevention and management complications of diabetes mellitus for productive population in Pekalongan Regency.

*“Some of the obstacles encountered during the implementation of the productive population diabetes mellitus prevention and control program encountered include: 1. programmers often*

*change so they have to readjust their understanding, 2. at the level of program implementation, often the percentage of community involvement in Posbindu PTM activities, screening, and prolanis activities are not optimal, with reasons of fear, the more people know they are increasingly afraid to find out their own health conditions, this is an obstacle to the success of the early detection program for diabetes mellitus events of productive population, 3. the next obstacle is the not yet strong recording and reporting system so that the basic data originating from public health facilities and private health facilities cannot be accessed so there is no adequate evidence base support.” (Head of the section on prevention and control of non-communicable diseases)*

*“The informant's obstacles that I felt included my lack of motivation to participate in the program intervention and time intervention was carried out at the same time as when I was working so that I could not take part in diabetes exercise and blood glucose checks.” (Participants survivors of diabetes mellitus).*

Theme 5 Factors driving and reinforcing programs for preventing and managing complications of diabetes mellitus for productive population in Pekalongan Regency.

*“Factors driving and reinforcing program implementation are commitments and policies.” (Provider implementor of non-communicable disease prevention and control programs)*

The implementation of the program to reduce the prevalence of diabetes mellitus and prevent complications in Pekalongan Regency has been carried out properly, namely through screening, prolanis, *Posbindu PTM*. This effort is in line with the opinion of Jill P Crandals who states that early detection can be done through the use of the same simple tests used in prevention programs, and can be done much more economically than trying to prevent diabetes at the population level [37]. Through screening efforts, it is hoped that blood glucose status can be identified early whether the condition is prediabetic or already in the condition of diabetes mellitus, so that preventive measures can be given not to proceed to diabetic conditions for prediabetics or not to progress to conditions of more severe complications for those who are detected with diabetes mellitus.

In the three locus areas studied, in Wiradesa, Tirto I and Kedungwuni I sub-districts, it was found that the pattern of programs to prevent and control diabetes mellitus had almost the same program variations, counseling at *posbindu*, self-care education, diet management, healthy lifestyle and physical activity, as well as consultations, prolanis gymnastics, education, blood glucose monitoring, home visits, doctor mentoring and reminders via whatsapp. This effort is in line with research conducted by Yeoh *et al.* which stated that the chronic care model (CCM) had been developed to improve patient health services by restructuring the health system in a multidimensional way [38]. Research on the CCM has been shown to reduce HbA1C profiles, blood pressure and blood lipids. This is also in accordance with Rashid's findings, that CCM has a positive impact on the implementation of self-management for people with diabetes [39].

In system theory, there are three important elements in evaluating whether a program is running well or not. These elements include input, process and output. According to GR.Terry in the book on the basics of management [40], [41], explains that the input consists of 6M, man, money, material, method, machine. Man is defined as a resource that supports the program, money is defined as financing/source of funds, material is defined as the raw material for implementing the program, method is the way of implementing the program, and machine is a support such as technology, IT and so on. In the latest research findings on the health system found that innovation is a contributing factor to the sustainability of health programs and systems in addition to human resources, financing, and other factors [42]–[46].

The process in system theory is the translation management functions consisting of planning, implementation, monitoring and evaluation. While the output is the outcome of a program. The results of a qualitative research regarding the evaluation of prevention and control programs concluded that, judging from the input analysis, the diabetes mellitus complication prevention and control program in Pekalongan Regency has fulfilled the element of adequacy in the number of providers who carry out program services both prolanis, *Posbindu PTM* and screening, however in some the programmer's research locus said that the limited number of human resources for health workers had resulted in the assistance of *Posbindu PTM* services not being optimal, but this condition could be overcome with the active participation of cadres and solid working relationships. Funding for prevention programs and reducing the prevalence of diabetes mellitus is sufficient and has shown to be able to support the sustainability of the program. Programmer advocacy at the village level had a good impact in the form of providing financial support from the village for the implementation of *posbindu* and support for cadres.

Program implementation methods are good, new knowledge regarding diabetes mellitus screening, *Posbindu PTM* services and prolanis have been properly disseminated by programmers to health cadres. Materials and supports/machines are defined as medical examination tools which include dr. glucose, scales, cholesterol checks and consumables in the form of glucose test kits (glucose, cholesterol and uric acid sticks), alcohol swabs, gloves are available through supports from the public health center and from the village. In the process aspect, which includes program planning, program implementation and monitoring and evaluation of diabetes mellitus prevention and control programs in Pekalongan Regency, it has been carried out well, it can be seen from the planning that has been carried out in stages starting from the disease prevention and control section, elaboration with the health promotion department, then submitted to the field then submitted for funding. Monitoring and evaluation of the screening program, *Posbindu PTM* and Prolanis are analyzed together by comparing planning with the achievement of performance indicators.

The output of the diabetes mellitus prevention and control program in Pekalongan Regency can be seen from the good running of all programs, prolanis, screening and *posbindu* at three locus running well. The findings of qualitative research which refer to system theory, are proven, that with adequate, adequate input and good processes according to the level and flow, good program output will be obtained. The strength of this study explores complications prevention and control programs complications of diabetes mellitus from various perspectives, the perspective of health providers, program managers and program implementers as well as from the perspective of beneficiaries, productive population diabetes mellitus sufferers who participate in intervention programs, so that the analysis compiled can be more comprehensive. However, the limitations of this research are limited to the rural context in Pekalongan district, Central Java, Indonesia, so it may not be suitable for application in different contexts.

#### 4. CONCLUSION

Research that explores programs for preventing and treating diabetes mellitus complications in the productive age group is very important considering the increasing prevalence of DM cases in the productive age group. This research resulted in the finding that there were three villages with the highest prevalence of diabetes mellitus in the productive population. Through non-communicable disease screening at *Posyandu*, chronic disease management programs and cross-sectoral activities, there are various initiatives to prevent and treat complications. However, the challenges faced include programmers who are always changing, programmers with many tasks, inadequate target awareness and low motivation, as well as poor recording and reporting systems. So basic information regarding individual and community health cannot be accessed. We hope that we can provide an overview of various programs for preventing and controlling complications of diabetes mellitus in productive populations in a rural context, with all existing support systems in the village such as health cadres and support from village officials. For further research, it is hoped that this research can continue with an in-depth evaluative approach to analyzing program strengths, weaknesses, threats and opportunities so that more comprehensive results are obtained.

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