



ORIGINAL RESEARCH

DIABETES COMPLICATIONS AS DIABETES PATIENTS PREDICTORS OF REFERRAL

Komplikasi Diabetes sebagai Prediktor Rujukan Pasien

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ABSTRACT

Background: Diabetes prevalence is growing faster in both developing and developed countries. Kidney failure, stroke, heart attack, leg amputation, and nerve damage are complications of diabetes caused by diabetes patients predictors of referral. **Purpose:** The study aims to describe diabetes complications as diabetes patients predictors of referral. **Methods:** The study design was used cross-sectional method. The population study is the participant with diabetes who have been treated in Public Health Care of Cangkringan from January 2018th until January 2019th. Samples were collected from total sampling who fulfilled the inclusion and exclusion criteria as complete medical records. The total sample was 414. Data of gender and age were collected from the medical record. Data of place was collected from GPS. Data of blood glucose level, complications and referral were collected from the medical record. Statistic test using chi-square and regression logistic. **Results:** Most diabetes patients were female, age > 55 years, diagnosis state long, distance ≤ 5 kilometres, no insulin-dependent, no complication, and no referral. Sex no significant differences PR = 0.91 (95% CI; 0.68-1.21), Age no significant different PR = 1.16 (95% CI; 0.88-1.51). Insulin significant different PR = 3.93 (95% CI: 3.17-4.88). Complication significant different PR = 3.53 (95% CI; 2.92-4.26). The main contributing to diabetes referral is a complication ($\beta = 4.25$; PR 71.20). **Conclusion:** The factors contributing to diabetes referral are insulin-dependent and complication, and the main factor contributing to diabetes referral is diabetes complication.

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ABSTRAK

Latar belakang: Prevalensi diabetes berkembang lebih cepat pada negara berkembang dan sedang berkembang. Kejadian gagal ginjal, stroke, serangan jantung, amputasi, dan kerusakan saraf merupakan komplikasi diabetes menyebabkan pasien dirujuk. **Tujuan:** Penelitian ini bertujuan untuk mendeskripsikan komplikasi sebagai prediktor untuk merujuk pasien. **Metode:** Rancangan penelitian menggunakan metode cross sectional. Populasi dalam penelitian yaitu penderita diabetes aktif berobat di puskesmas Cangkring dengan diagnosis diabetes mellitus tipe 2 berdasarkan catatan medical record selama periode Januari 2018 sampai Januari 2019. Sampel yang diambil adalah total sampel yang memenuhi kriteria inklusi dan eklusi yaitu memiliki catatan medis lengkap. Data mengenai jenis kelamin dan usia dikumpulkan melalui catatan medis. Sampel total berjumlah 414 Data lokasi didapatkan melalui GPS, data mengenai kadar gula darah, komplikasi dan rujukan dikumpulkan melalui catatan medis. Uji statistik menggunakan uji chi square dan regresi logistik. **Hasil:** Mayoritas pasien adalah perempuan, usia > 55 tahun, penderita lama, jarak puskesmas < 5 kilo meter, tidak tergantung insulin, tidak ada komplikasi, tidak dirujuk. Jenis kelamin tidak signifikan terhadap rujukan PR = 0.91 (95% CI; 0.68-1.21), usia tidak signifikan terhadap rujukan PR = 1.16 (95% CI; 0.88-1.51), komplikasi PR = 3.53 (95% CI; 2.92-4.26) dan ketergantungan insulin PR = 3.93 (95% CI: 3.17-4.88) merupakan faktor yang berkontribusi terhadap rujukan. Komplikasi merupakan faktor dominan pasien diabetes di rujuk ($\beta = 4.25$; PR 71.20). **Kesimpulan:** Faktor yang berkontribusi terhadap penderita di rujuk adalah ketergantungan insulin dan komplikasi, dan faktor yang paling dominan adalah komplikasi.

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INTRODUCTION

Based on World Health Organization (2016), estimated adults were living diabetes 422 million in 2014, compared in 1980 people living diabetes were 108 million. Case of diabetes from 4.70% to 8.50% in the adult population. The majority of people with diabetes are affected by type 2 diabetes. Diabetes prevalence increases in developing countries compared with developed countries. Diabetes patients with high mortality have cardiovascular conditions and other diseases. An estimated 43% of 3.70 million deaths occurred under 70 years of age. The study of Chessman, Patterson, Nippita, Drayton, & Ford (2018) that incidence of diabetes type 1 for 0 – 14 years estimated 45.00%. The study also showed an increase in diabetes in adults.

Complications of diabetes are the dominant factor causing death due to diabetes. A previous study indicated that complications are the most contributing factor of deaths caused by diabetes. It

was also already known that people from 50 years and above are more prone to diabetes complications (Ossei et al., 2019). World Health Organization (2016) stated that long period diabetes increases the risks of cardiovascular and other diseases. Ayalneh, Mesfun, Abebe, & Getachew (2019) said that 189 study subjects, 123 (65.10%), were found renal damage. Bjerg et al (2018) stated that of 3,586 sample incidence rate ratios in individuals with two previous complications, diabetic kidney 3.20 (95% CI 2.30 - 4.50).

The previous study of a few countries estimated that Ethiopia identified a high prevalence of Kidney Disease (KD), which is 65.10%, among diabetes adult patients (Ayalneh, Mesfun, Abebe, & Getachew, 2019). Sandi, Martini, Artanti, & Widati (2019) study in Indonesia stated that subjects with a coronary heart between the age of 56 until 65 years estimated 43.05% and the majority is male, 70.84%. Fasil, Biadgo, & Abebe (2019) stated that from 367

diabetes patients, it is estimated that 222 patients diabetes with low glucose control $FBS \geq 152$ mg/dl is 60.50%.

The previous study, Wolde et al (2018) concluded that risk factors of diabetes complications as hypertension at baseline, cholesterol > 100 mg/dl, triglycerides > 150 mg/dl, high-density lipoprotein cholesterol ≥ 40 mg/dl, and sex significant predictors vascular complication. Fasil, Biadgo, & Abebe (2019) stated that subjects aged 65 years (AOR: 0.07; 95% CI: 0.01–0.30) were significant in decreasing diabetes control. Diabetes complications increase as patients have low glucose control (61/222). Study Ghaem, Daneshi, Riahi, & Dianatinasab (2018) stated that most people with diabetic kidney disease reach the nephrologist after the end-stage renal disease has occurred, and complications have set on.

The previous study literature conducted by Rhee & Kim (2018), based on the summary review, concluded that age had a significant impact on diabetes complications. Age is the biggest contributor to the development of diabetes complications. The World Health Organization (2016) stated that heart attack, stroke, kidney failure, and leg amputation increase patient diabetic complications. Wolde et al (2018) study concluded that a high incidence of vascular diabetic complications is a public health problem.

In their study, Sandi, Martini, Artanti, & Widati (2019) concluded that the risk factors found are coronary heart as smoke, blood pressure, hyperlipidemia, diabetes, and low physical activity. Ekoru et al (2019) stated that factor contributing for diabetes complication are hyperlipidemia 34% (95% CI = 32–36) and obesity 27% (95% CI = 25–29). That study also stated that the prevalence of complication such as 32% (95% CI = 30–35) for cataracts, 15% (95% CI = 13–17) for diabetic retinopathy, 13% (95% CI = 12–15) for impaired renal function, and 35% (95% CI = 32–38) for erectile dysfunction.

Risk factors correlation diabetes such as education, social-economic poor, self-care, overweight. A previous study conducted by Aschalew, Yitayal, Minyihun, & Bisetegn (2019) that factors significant related low self-care practice of diabetic patients as primary level of education Adjusted Odds Ratio (AOR) = 2.62; 95% CI = 1.20–5.70), AOR = 3.33 (95% CI = 1.61–6.88) for living in rural area, OR = 0.31 (95% CI = 0.15–0.62) for having strong social

support, AOR = 2.20 (95% CI = 1.12–4.30) for having diabetes-related complication, and AOR = 2.16 (95% CI = 1.17–3.98) for low socio-economic status. Karimah (2018) stated that 36.10% of the subject was overweight, and the state of overweight was significantly related to glucose levels $p < 0.05$.

Characteristic of subject as factor that contributing complication is genetic factor (Susanto & Ftriani, 2018). Family history of diabetic was significant relationship complications of diabetes $p = 0.02$. Ghaem, Daneshi, Riahi, & Dianatinasab (2018) result based multivariate analysis that factors for Diabetic Retinopathy (RD) low education levels AOR = 0.43 (95% CI = 0.24–0.76), AOR = 1.70 (95% CI = 1.02–2.83) for overweight, AOR = 1.88 (95% CI = 1.09–3.26) for obese, and AOR = 2.35 (95% CI = 1.48–3.73) for diabetes duration of 10 to 20 years and AOR = 5.63 (95% CI = 2.97–10.68) for over 20 years, AOR = 1.99 (95% CI = 1.27–3.10) for receiving insulin, and AOR = 1.71 (95% CI = 1.02–2.85) for having chronic diseases.

Health facilities as factors contributed for referral diabetes. A previous study that conducted by Alabdulwahhab (2019) stated that the level of HbA1c is significant related to diabetic retinopathy ($p < 0.01$). High HbA1c levels with patients who have uncontrolled diabetes have contributed 66.61% to the development of diabetes. Factor correlation for referral diabetes as a complication, from a previous study shown at Fasil, Biadgo, & Abebe (2019) study, concluded that there was still a high prevalence of diabetes patients with low glucose control and diabetes complications. A study of Aschalew, Yitayal, Minyihun, & Bisetegn (2019) showed patients with diabetes had low self-care practice at 51.86% (95% CI = 46.95–56.72%). The study that conducted by Ghaem, Daneshi, Riahi, & Dianatinasab (2018) in Iran concluded that the factors of long duration of diabetes, obesity, chronic diseases are strongly associated with diabetic retinopathy.

Diabetes emergency follows up for intervention quickly. The previous study by Wolde et al (2018) concluded that targeted interventions addressed diabetes patients with complications such as cholesterol, high blood pressure and abnormal lipid. Patients who have diabetes complications should be follow up with a clinics service. The purpose study is to describe complication condition factors for predicting diabetic referral.

METHODS

This cross-sectional study was carried out at the Public Health Center (PHC) of Cangkringan, Sleman District. There were 414 samples required in this study with the medical record. Data demographics and clinical diagnosis were collected from January 2018th until January 2019th. The clinical records of the patients were investigated by accessing their clinical reports from the medical record to establish diabetes as the primary clinical diagnosis. Samples were selected by the inclusion and exclusion criteria from the completed medical record.

Individual data such as sex and age were obtained from the medical record. Place data were obtained from GPS. Glucose levels were collected from the doctor's diagnosis in the medical record, data on diabetes complications were collected from the doctor's diagnosis in the medical record, and referral data were collected from the medical record.

Data containing patient diagnoses and diabetes control were compiled into excel and analyzed using statistical analysis software for frequency distribution, descriptive statistics and correlation tests. The variables of sex were divided into two categories, male and female. The variables of age were divided into two categories, > 55 years old and ≤ 55 years old. The variables of

distance were split into two categories, > 5 kilometres from PHC and ≤ 5 kilometres from PHC. The variables of insulin-dependent were divided into two categories consisting of *yes* if the medical record diagnosis was positive and *no* if the medical record was negative. The variables of complication were split into two categories, *yes* if participants had detailed other disease-based medical records and *no* if participants were just people with diabetes only. The variables of referral were divided into two categories, which were *yes* if participants were referred to hospital and *no* if participants were just treated in PHC of Cangkringan. Statistic test using chi-square test and logistic regression. The committee of human research Publication and Ethics No. 183.3/UNRIYO/PL/VII/2018 of the Faculty of Public Health, Respati University Yogyakarta, have approved the study.

RESULTS

Table 1 shows that the majority of sex have female about 279 (67.40%), age variable > 55 years about 230 (55.60%), distance ≤ 5 were 409 (98.10%), variable of insulin-dependent no insulin-dependent is 316 (76.30%), variable of complication no complication is 331 (80%), and variable of referral no referral is 267 (64.50%).

Table 1

Distribution of Respondent and Chi-Square Analysis for Sex, Age, Distance, Insulin-Dependent, Diabetes Complication with Diabetes Referral

Variable	Referral				Total		p	PR (95% CI)
	Yes		No		n	%		
	n	%	n	%				
Sex								
Male	45	10.90	90	21.70	135	32.60	0.59	0.91 (0.68-1.21)
Female	102	24.60	177	42.80	279	67.40		
Age (years)								
> 55	87	21.00	143	34.50	230	55.60	0.31	1.16 (0.88-1.51)
≤ 55	60	14.50	124	30.00	184	44.40		
Distance (km)								
> 5	35	8.50	63	15.20	8	1.90	1.00	0.99 (0.84-1.17)
≤ 5	112	27.10	316	49.30	406	98.10		
Insulin-Dependent								
Yes	73	17.60	10	2.40	98	23.70	0.01	3.93 (3.17-4.88)
No	74	17.90	257	62.10	316	76.30		
Complication								
Yes	53	12.80	4	1.00	83	20.00	0.01	3.53 (2.92-4.26)
No	94	22.70	263	64.50	331	80.00		
Total	147	35.51	267	64.49	414	100.00		

Based on the chi-square test, it is shown from Table 1 that sex have no significant differences with referral PR = 0.91 (95% CI; 0.68-1.21). variable age no correlation with referral PR=1.16 (95% CI = 0.88-1.51). There is significant different insulin with referral PR = 3.93 (95% CI = 3.17-4.88). Variable complication significant different with referral PR = 3.53 (95% CI = 2.92-4.26).

Table 2 showed that the primary variable contributing to diabetes referral is the complication with $\beta=4.25$ and probability risk for referral 71.20. The referral probability of diabetes patients with complications is 71.20 compared with diabetes patients with no complications.

Table 2
Multivariate Analysis Result of Complication and Insulin-Dependent with Diabetes Referral

Variable	β	Wald	PR 95% CI
Complication	4.26	59.24	71.20 (24.03-210.97)
Insulin- Dependent	3.75	94.72	42.86 (20.10-91.35)
Constanta	-6.04		

DISCUSSION

Based on the analysis, it is shown that most diabetes patients are male and age > 55 years. A previous study by Alabdulwahhab (2019) stated that the average of patients age 54.95 ± 11.65 years. Ghaem, Daneshi, Riahi, & Dianatinasab (2018) study that mean \pm standard deviation age 56.64 ± 12.45 years old. Siddique, Islam, Banik, & Rawal (2017) study stated that the average age of participants was 52 ± 10 years. Most diabetes patients are females 58% and urban 74%—diabetes disease established in people age 50 years and above (Ossei et al., 2019). Diabetes is increasing every year, predominantly in low-income countries. World Health Organization (2016) that adults are living with diabetes and disease complications estimated 422 million adults. The incidence of diabetes is increasing in adults. A previous study by Patterson et al (2019) stated that incidence estimation of diabetes type 1 for 0–14 year is 45%. Diabetes in an adult is increasing.

The health facilities of diabetes patients are under 5 5-kilo meters of the Public Health Center of Cangkringan. A previous study by Siddique, Islam, Banik, & Rawal (2017) showed that in

Bangladesh, most participants were urban residents (74%), with a median duration of service waiting time at health facility around 30 and 45 minutes, respectively. Simão et al (2017) study in Brazil concluded that facilities unsatisfactory no significant association with diabetes care outcomes. However, no association between structure, process, and results were found. Diabetes patient in this study majority is not insulin-dependent. It can be caused by low diabetic control blood glucose. Previous study Siddique, Islam, Banik, & Rawal (2017) study in Bangladesh concluded that 37% of the participants' check-up glucose every month. Simão et al (2017) study in Brazil concluded that a high proportion of problems regarding referrals to the health facility. A low rate of adequate glucose control was also observed.

The current study showed that most diabetes patients have no complications. This condition may be caused by early detection and good diabetes control. In another site, it is related to close distance with the public health service of Cangkringan. A previous study by Ayalneh, Mesfun, Abebe, & Getachew (2019) concluded that Ethiopia identified a high prevalence of Kidney Disease (KD), which is in Ekoru et al. (2019) study stated that factors contributing to 65.10% KD cases are diabetes complications. Complications of diabetes include hyperlipidemia, obesity, cataracts, diabetic retinopathy, impaired renal function. Karimah (2018) study stated that participants were mostly overweight 36.10%, significantly correlations glucose levels $p < 0.05$. Bjerg et al (2018) concluded that complication related organ damage.

The current study showed that the majority of diabetic patients have no referral. A previous study conducted by Salamanca, Geary, Suárez, Benavent, & Gonzalez (2018) at Peru showed that medical record in a public health center that 6012 diabetes patients were found 5632 diabetes patients were referenced. Albarrak et al (2018) study about the evaluation of diabetic referral that majority patients no referral is 80.70% and referral is 19.30%.

Study in Saudi Arabia by Senitan, Alhaiti, Gillespie, Alotaibi, & Lenon (2017) showed that 12 systematic reviews identified that all of the study, not good referral systems. The referral problems include unnecessary requests for referral addressed, unstructured referral and no guidelines for referral. Grill & Brimble (2018) study concluded that the effectiveness of managing the disease in primary care must continue by working together with other professionals for improving.

According to referral standards, nearly 26.50% referred to a dietitian for medical nutrition therapy.

The Chi-square test in the current study showed that sex, age and distance were not significantly different. The further results concluded that age significantly impacts diabetic vascular complications (Rhee & Kim, 2018). It may be caused by different samples required in this study majority > 55 years. Another study by Aschalew, Yitayal, Minyihun, & Bisetegn (2019) showed that primary factors are level of education, living in a rural area, having strong social support, having diabetes-related complications, and economic status.

The chi-square test concluded that insulin and complication contribute to diabetes referral. The previous study showed that the prevalence of low glucose control and diabetes complications is still high (Fasil, Biadgo, & Abebe, 2019). The study conducted by Ghaem, Daneshi, Riahi, & Dianatinasab (2018) in Iran concluded that diabetes incidents have a significantly longer duration, obesity is factor correlated with diabetes complications. A study by Fasil, Biadgo, & Abebe (2019) from 367 diabetes patients estimated 222 (60.50%) of them had poor glucose control. The study done by Ekoru et al. (2019) showed that factors contributing to diabetes complications are hyperlipidemia 34%, obesity 27%, retinopathy 15%, renal function 13%.

A study conducted by Alabdulwahhab (2019) showed that HbA1c was a significant cause of patients diabetic retinopathy ($p < 0.01$). The uncontrolled diabetes patients are directed to public health services; 66.61% have an increase in retinopathy. Diabetic control is important for glucose control and decreased referral. A previous study by Aschalew, Yitayal, Minyihun, & Bisetegn (2019) concluded that hospital care service is low and that the self-care diabetes patient is low. Factors related to significant low self-care patients diabetes such as education, residence, socioeconomic status, complication and social support.

The multivariate analysis of the current study showed that the dominant variable contributing is the complication. Diabetes disease impacts public health problems such as economic loss. The complications are contributing to the deaths caused by diabetes. Other studies also concluded that complications contribute most to diabetes deaths (Ossei et al., 2019). A previous study by Wolde et al. (2018) concluded that diabetic complications are hypertension, HDL and vascular. A study by Ayalneh, Mesfun, Abebe, & Getachew (2019)

showed that from 189 study subjects, 123 (65.10%) were found to have evidence of renal damage. A previous study by Ghaem, Daneshi, Riahi, & Dianatinasab (2018) concluded that lower education levels, overweight or obesity, duration of time having diabetes, receiving insulin, and suffering chronic illness are significant correlation diabetes complications.

Regulation for referral important for decreasing diabetes deaths in south Asia suggests providing a framework for building a pragmatic referral policy (Kalra, Sahay, & Sahay, 2018). The policy will be relevant to health care systems operating. Timely referred allows to inhibit the progression of renal impairment, minimize complications, and enhance the quality of life. Decreasing diabetes deaths can be done by screening, self-care intensive, utilization of health services (Salamanca, Geary, Suárez, Benavent, & Gonzalez, 2018). A study by Davies et al (2019) improved biomedical and psycho-social outcomes of people with diabetes could be reached by increasing referral. Study limitations are data secondary using and collected with patient's medical record.

Research Limitations

The limitations of this study are during the data collection process with secondary data-limited variables. Secondary data from medical records have high validity because diagnosis is obtained from doctor professionals.

CONCLUSION

The factor contributing to diabetes referrals are insulin dependence and complications. The main factor contributing to diabetes referral is diabetes complications. Diabetes complications are a very serious problem for the patient, and a previous study concluded that diabetes complications were the factor that caused patients' deaths. Improving referral system operation could prevent diabetic deaths.

CONFLICT OF INTEREST

There is no conflict of interest.

AUTHOR CONTRIBUTION

NS: conceptual, study design, data analyzed, final approval, writing the original draft manuscript, submission manuscript, revised manuscript, YYR: data collecting, coordinating

research site. NS and YJR: fix manuscript to be published.

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