Do urban/rural and educational differences influence diabetes patients' risk of developing Common Mental Disorders? Indonesian cross-sectional Community Health Survey analysis

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Abstract

Background

Depression is one of the major comorbid conditions associated with chronic diseases like diabetes. There are a several studies of diabetes and CMD including diabetes depression (DD) and diabetes-related distress (DRD) in Indonesia mostly performed in health facilities. To the authors' knowledge, there are yet to be studies exploring the risk of diabetes comorbid on CMD. This analysis is the first to explore urban-rural and educational level differences of diabetes patients risk for also having comorbid CMD using the latest Indonesian community health survey.

Methods

This is secondary cross-sectional data analyzed using the latest 2018 Indonesian community health survey Riskesdas comprised of 240703 respondents aged 30 or higher. CMD data based on face to face interviews using the SRQ-20. Diabetic conditions and other chronic diseases based on doctor's diagnosis were reported by the respondents in the interview. Descriptive bivariate and multivariate logistic regression analyses were carried out for identify risk profiles on Common mental disorders (CMD) for diabetes patients by geographic and social factors.

Results

Three-point three percent of the sample had diabetes-related diagnoses, and almost 20% of diabetes patients had CMD. The analysis identifies different risk of CMD among diabetes patients according to place of residence and education. The highest risk of diabetes without complications diagnosed for developing a CMD is among poorer educated rural patients, while the lowest was among poorer educated urbanites. Being more highly educated in both rural and urban settings shared almost the same risk. Higher educational attainment in a rural setting is most protective – these diabetes patients have the lowest risk of developing a CMD

Conclusions

The differing risk profiles of CMD among diabetic patients underpin the importance of tailoring mental health service delivery among diabetics in different geographic settings for patients of differing educational backgrounds.

Background

Diabetes mellitus, a common chronic disease is a global health problem with serious medical and economic consequences (1). In most countries the prevalence of diabetes mellitus is increasing; the International Diabetes Federation (IDF) in 2017 estimated 451 million adults living with diabetes worldwide. This number is projected to increase to 693 million by 2045 (2). In Indonesia it is the third largest contributor to disability life adjusted years (DALYs) according to the Global Burden of Disease Studies (3). Severe diabetes-specific complications include kidney failure, vision loss, or foot amputation. Comorbidities are common, in particular, cardiovascular diseases, which may result in premature death is associated with poorly controlled diabetes. Therefore, effective disease management is a key factor in reducing the health and financial burden of diabetes. (4)

Depression is Common Mental Disorder (CMD) which results in significant functional impairment and decreased life expectancy. Globally depression causes cumulative greater disability due to the high numbers of people currently experiencing depression 300 million; (5). The burden of physical illness may be accompanied by an increased risk of CMD (6). Indicators of CMD including depressive symptoms or diagnoses of major depressive disorder (MDD) are more common in people with diabetes compared to those without diabetes (7).

Depression is one of the major comorbid conditions associated with chronic diseases like diabetes. It was estimated 40% of patients with diabetes had depression. Recent studies revealed that depression is twice as prevalent among individuals with Type 2 Diabetes Mellitus (T2DM) compared to controls. A systematic review shows that the prevalence of depression in patients with diabetes mellitus ranges between 6 and 43%. The presence of depression is higher in people with T2DM than healthy

controls (6). Comorbid Depression with chronic physical illnesses may negatively affect health outcomes. These co-occurring conditions may decrease treatment compliance and influence metabolic control, result in poor adherence to medication and diet regimens, decrement quality of life, as well as higher health care expenditure. The co-existence of NCDs, such as hypertension and diabetes, with CMD including depression, is unfavorable to care and prognosis which may cause poor glycemic control, uncontrolled hypertension, greater risk of cardiovascular complications, and higher mortality rates. A survey conducted by the World Health Organization (WHO) across 60 countries, found that between 9.3–23.0% of patients with chronic diseases had comorbid depression (8). Several previous studies have found that comorbid depression in diabetes is associated with lower self-care and treatment adherence, poor glycemic control, higher complication rates, and increased mortality (9). However, other studies did not indicate such an association. (4)

Depression is a significant condition that might complicate diabetes treatment. Depression and NCD co-morbidity worsen outcomes and is associated with poorer self-management and treatment adherence, minimized treatment response, and increase morbidity and mortality for both. Undiagnosed depression in these populations leads to only a few affected people accessing proper treatment (10). The overlap between depressive symptoms and non-communicable diseases (NCDs) are associated with pathogenesis and complications and negatively impact other clinical, economic and social aspects. To some extent, depression has been associated with poor adherence to treatment, higher health care costs, and worse quality of life in people with T2DM or hypertension (11). To achieve diabetes treatment goals for better health benefits, considering the impact of psychopathology in patients with T2DM is a must (1).

There are a several studies of diabetes and CMD including diabetes depression (DD) and diabetes-related distress (DRD) in Indonesia mostly performed in health facilities (12,13). To the authors' knowledge, there are yet to be studies exploring the risk of diabetes comorbid on CMD. This analysis is the first to explore urban-rural and educational level differences of diabetes patients risk for also having comorbid CMD using the latest Indonesian community health survey *Riskesdas* 2018. The result of this analysis is valuable for health providers to design programs or interventions encouraging adherence to treatment and self-care among diabetics.

Methods

Study Design

This is secondary cross-sectional data from the Basic Health Research (*Riset Kesehatan Dasar, RISKESDAS*) survey conducted by the Ministry of Health, the Republic of Indonesia in March 2018 analysis. *RISKESDAS* is a routinely conducted national household health survey since 2007 (in 2007, 2010, and 2013). A multistage systematic random sampling method was applied for respondent selection. Identifying groups of census blocks and designated them as primary sampling units (PSUs) was the initial step. Probability proportional to enrolment size design was applied to identify a census block from each PSU in the second stage. Selection 180,000 out of 720,000 census blocks (CB) from the master frame obtained in 2010 Indonesian population survey by The Indonesian Central Bureau of Statistics or *Badan Pusat Statistik* (BPS), as the sampling frame using Probability Proportional to Size (PPS) method, was applied to represent urban-rural for each sub-districts at the district level. All household members who live for at least 6 months in the household and are involved in one food management in the selected household were interviewed face to face as sample. (14) .

Participants

Analysis was applied for respondents' age 30 or higher. All respondent data used in this analysis was based on the results of interviews using structured instruments by trained enumerators with a health education background. A total of 240703 respondents had complete data which were analyzed in this paper.

Measures

Outcome. Common Mental Disorder (CMD) including psychological distress was the respondent's mental state at interview during data collection. It was a score measured by SRQ-20. Respondents were categorized experienced psychological distress if the score is above 5 (15,16). SRQ-20 was developed by the WHO to detect mental illness in primary health care in developing

countries (17). It was developed for clinical and research use for nonspecific psychological distress. It is preferable to disorder-specific tools as the nonspecific tools will also provide an indicator of the severity of the distress regardless of the actual diagnosis (18)

The items were extracted from pre-existing psychiatric screening instruments: the Admission Screening and Resident Review (PASSR); the Patient Global Impressions (PGI); the General Health Questionnaire (GHQ); and the shortened version of the present state examination (PSE). SRQ-20 has a high Cronbach value indicator of internal consistency of ($\alpha>0.80$) (19). We used this instrument to detect non-psychotic symptoms of nonspecific psychological distress. This short symptom screen contains 4 questions related to physical symptoms (headache, lack of appetite, poor digestion, and uncomfortable feelings in the stomach) (17).

Explanatory. As for the explanatory variables, chronic disease including diabetes was defined as to whether the respondent had ever been diagnosed by a doctor with one of the following conditions: high blood pressure, diabetes, cancer, lung disease, heart problems, stroke, or arthritis as the first independent variable of interest. The second explanatory variable education, consisted of two categories, low education comprised of those who had not yet completed high-school. High education was defined as those who had completed high-school or additional levels of education. Place of residence was classified as either rural or urban according to BPS classification, marital status (single/married) and sex (male/female) were the control variables used in the analyses.

Data Analysis

The binary outcome variable was probable CMD as measured by the Self Report Questionnaire 20 item (SRQ-20) with those having scores less than 6 as the reference group. Diabetes status consisting diabetes with and without complication was the main predictor with a place of residence and education as a potential confounder of the main independent outcome. Diabetes with complication consisted of diabetes with NCD including Stroke, Diabetes no Stroke with NCD, no Diabetes no Stroke with NCD, no Diabetes with NCD including Stroke. Sex and marital status were the control variables.

Results

Urban-rural and educational level differences as well as their risks for the main outcome variable of CMD, main independent variable of diabetes status, and the covariates of sex and marital status are displayed in Table 1 and Table 2.

Table 1. Proportion of diabetes related diagnoses, Common Mental Disorder (CMD), sex and marital status by residence and education.

	Residence			Education		Total
	Urban (%)	Rural (%)		Low (%)	High (%)	N
No diabetes diagnosis	95.77	97.55		96.78	96.67	232846
Diabetes-related diagnosis	**4.23**	**2.45**		**3.22**	**3.33**	**7857**
No NCD diagnosis	72.02	74.21		70.95	76.82	176216
Diabetes without complication	2.10	1.18		1.51	1.74	3853
Diabetes with other NCD and no stroke diagnosis	1.92	1.17		1.56	1.42	3633
Diabetes comorbid with stroke diagnosis	0.22	0.10		0.15	0.17	371
No diabetes with other NCD no stroke diagnosis	22.58	22.47		24.74	18.99	54213
No diabetes with comorbid NCD stroke diagnosis	1.17	0.87		1.09	0.87	2417
No CMD (SRQ < 6)	90.19	87.33		86.05	92.78	213359
CMD (SRQ > 5)	9.81	12.67		13.95	7.22	27344
Low education	46.38	74.27	**Urban**	34.51	63.75	
High education	53.62	25.73	**Rural**	65.49	36.25	
Single	12.10	9.81		11.32	10.11	26129
Married	87.90	90.19		88.68	89.89	214574
Total (N)	110150	130553		148044	92659	240703

Data Source: Riskesdas 2018 age range 30-59

The proportion of diabetes-related diagnoses was consistently higher in urban or amongst those with higher levels of education. Different patterns occurred in CMD with a higher proportion among those living in rural areas or with low education.

Table 2. Risks of diabetes related diagnoses, sex, marital status, residence and education On Common Mental Disorder (CMD)

	OR	95% CI		
		Low	High	Sig
Diabetes status				
Healthy	1	1	1	
Diabetes without complication	1.619	1.473	1.781	P<0.001
Diabetes with other NCD and no stroke diagnosis	2.953	2.724	3.202	P<0.001
Diabetes with other NCD and stroke diagnosis	5.339	4.278	6.664	P<0.001
Other Ncd **No diabetes** no stroke diagnosis	1.861	1.808	1.915	P<0.001
Other Ncd with stroke **No diabetes**	3.405	3.094	3.746	P<0.001
Place of residence and education				
Urban high education	1	1	1	
Rural high education	1.260	1.197	1.326	P<0.001
Urban low education	1.950	1.871	2.033	P<0.001
Rural low education	2.215	2.134	2.299	P<0.001
Sex				
Male	1	1	1	
Female	1.502	1.461	1.545	P<0.001
Marital status				
Married	1	1	1	
Single	1.420	1.368	1.473	P<0.001

Data Source: Riskesdas 2018 age range 30-59

Different risks of diabetes status, various education level and place of residence as well as sex and marital status on CMD appears in table 2. Diabetes without complication or having only NCD contributes the lowest risk on CMD, while comorbid with stroke contributes the highest risk on CMD. Urbanites and rural people with higher education have the lowest risk on CMD.

The various prevalence and risks of CMD among diabetes- diagnosed patients according to place of residence and education is illustrated in Tables 3 and 4.

Table 3. Proportion of diabetes related diagnoses and Common Mental Disorder (CMD) by area of residence and education level

	Urban high (%)	Rural high (%)	Urban low (%)	Rural low (%)	Total (%)
No CMD (SRQ < 6)	93.25	91.95	86.65	85.73	88.64
CMD (SRQ > 5)	6.75	8.05	13.35	14.27	11.36
No diabetes diagnosis	96.16	97.56	95.31	97.55	96.74
Diabetes-related diagnosis	3.84	2.44	4.69	2.45	3.26
No NCD diagnosis	75.64	78.89	67.83	72.59	73.21
Diabetes without complication	2.01	1.26	2.20	1.15	1.60
Diabetes with other NCD and no stroke diagnosis	1.63	1.07	2.26	1.20	1.51
Diabetes with other NCD and stroke diagnosis	0.20	0.11	0.24	0.10	0.15
Other NCD No diabetes with no stroke diagnosis	19.58	17.94	26.05	24.04	22.52
Other NCD and stroke No diabetes diagnosis	0.94	0.73	1.43	0.91	1.00
Total (N)	59066	33593	51084	96960	240703

Data Source: Riskesdas 2018 age range 30-59

Highest proportion of CMD experienced by rural people with lower education while lowest CMD for the urbanites with higher education. Meanwhile, urbanites with lower education bear the highest prevalence of diabetes related diagnoses while rural people with higher education have the lowest CMD prevalence.

Table 4. Proportion of Common Mental Disorder (CMD) by residence and education-level by diabetes related diagnoses

	No NCD	Diabetes*	Diabetes only*	Diabetes NCD no stroke*	Diabetes NCD with stroke*	NCD No diabetes no stroke	NCD stroke No diabetes	Total
	(%)		(%)	(%)	(%)	(%)	(%)	(%)
No CMD	90.79	81.07	86.43	76.85	66.85	83.35	75.01	88.64
CMD	**9.21**	**18.93**	**13.57**	**23.15**	**33.15**	**16.65**	**24.99**	**11.36**
N	176216	7587	3853	3633	371	54213	2417	240703
	Urban hi education							
No CMD	94.50	88,49	91.67	85.73	78.81	89.74	85.43	93.25
CMD	**5.50**	**11.51**	**8.33**	**14.27**	**21.19**	**10.26**	**14.57**	**6.75**
N	44678	2267	1189	960	118	11565	556	59066
	Rural hi education							
No CMD	93.21	86.92	89.60	84.68	77.78	87.44	83.74	91.95
CMD	**6.79**	**13.08**	**10.40**	**15.32**	**22.22**	**12.56**	**16.26**	**8.05**
N	26501	818	423	359	36	6028	246	33593
	Urban low education							
No CMD	89.43	78.77	85.68	73.70	62.81	81.61	72.57	86.65
CMD	**10.57**	**21.23**	**14.32**	**26.30**	**37.19**	**18.39**	**27.43**	**13.35**
N	34649	2937	1124	1152	121	13309	729	51084
	Rural low education							
No CMD	88.20	74.32	80.39	70.22	53.13	80.11	68.06	85.73
CMD	**11.80**	**25.68**	**19.61**	**29.78**	**46.88**	**19.89**	**31.94**	**14.27**
N	70388	2375	1117	1162	96	23311	886	96960

Data Source: Riskesdas 2018 age range 30-59

* total in column 3 is the sum of column 4, 5, 6

General patterns are 'healthy people' has the lowest CMD proportion, followed by diabetes without complications, diabetes without stroke, and diabetes with stroke. The lowest proportion of psychological distress was in more highly educated urbanites, while the highest proportion was in low educated rural residents. Except for the 'healthy group', the lowest CMD proportion was among diabetes without complication in more highly educated urban patients, while the highest CMD proportion was among diabetes patients with a comorbid NCD with stroke diagnoses who had lower educational attainment and lived in a rural setting.

Table 5. Odds ratio for having Common Mental Disorder (CMD) for diabetes-related diagnoses as a function of residence and education-level

	urban high education			rural high education			urban low education			rural low education		
	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper	OR	Lower	Upper
Diabetes without complication	1.64	1.33	2.03	1.62	1.18	2.23	1.37	1.16	1.63	1.75	1.50	2.03
Diabetes with other NCD and no stroke diagnosis	2.85	2.36	3.43	2.48	1.85	3.32	2.79	2.43	3.19	2.95	2.59	3.35
Diabetes with other NCD and stroke diagnosis	4.75	3.04	7.43	4.25	1.93	9.37	4.84	3.34	7.03	6.16	4.11	9.22
Other Ncd	1.93	1.80	2.08	1.95	1.79	2.14	1.82	1.72	1.92	1.79	1.72	1.86
No diabetes no stroke diagnosis												
Other Ncd with stroke	3.06	2.41	3.90	2.75	1.95	3.88	3.22	2.72	3.80	3.49	3.02	4.03
No diabetes												
Female	1.49	1.39	1.59	1.44	1.33	1.56	1.48	1.40	1.57	1.49	1.43	1.55
Single	1.72	1.58	1.88	1.62	1.44	1.83	1.34	1.25	1.43	1.34	1.27	1.41

Data Source: Riskesdas 2018 age range 30-59

The highest risk of diabetes without complications diagnosed for developing a CMD is among poorer educated rural patients, while the lowest was among poorer educated urbanites. Being more highly educated in both rural and urban settings shared almost the same risk. Higher educational attainment in a rural setting is most protective – these diabetes patients have the lowest risk of developing a CMD except for NCDs, specifically patients with no diabetes or stroke shared a similar risk with those who were more highly educated living in urban settings. For this diagnosis group risk of CMD was lower in the group that had lower education.

Discussion

The analysis showed different risks of developing CMD among diabetics living in urban rural with various education level. The latest Indonesian community health survey revealed 3.3% of the population has diabetes-related diagnoses, 11.4% with CMD, almost 20% of diabetes patients had high enough symptoms of nonspecific psychological distress to suggest CMD. The occurrence of CMD in diabetes patients could hamper treatment adherence which could worsen treatment outcomes. Contrary to Dani et al (2020), reported from this same *Riskesdas* 2018 survey from laboratory samples taken at the time of participant interview, pre-diabetes prevalence was higher in rural populations. This analysis was obtained from blood tests taken at the time of interviews with respondents; some of whom showed a positive test for pre-diabetes which they were unaware of. This explains the inconsistencies in our findings. According to explicit answers to interview questions the proportion of diabetes-related diagnoses was higher in urban populations. This result of lower diabetes proportions in rural populations could be a consequence of under-reporting since this analysis used diabetes-related diagnosis, which applied only for respondents who had

ever visited a health facility. However, according to nutrition transition framework / theory, it may indicate that nutrition transition level 4 and 5 phenomena currently take place in Indonesia. Level 4 transition is marked by higher diabetes risk in urban and higher educated samples reflecting higher BMI due to sedentary lifestyle and diet patterns. Level 5 as could be viewed in urban samples is manifest by a higher diabetes proportion among the lower educated, since those with higher education are understood to more frequently adopt a healthy lifestyle with more physical activity and better diet (Seiglie et al., 2020 ; Drewnowski & Popkin, 1997).

Indonesian latest report showed there was an unequal distribution of high-skilled health providers (22). Most specialists flocked to urban settings. Another possibility is rural people delayed treatment until symptoms of any illness were more severe, rather than accessing facilities for early detection or treatment. Delayed treatment seeking is a common phenomenon among those living in rural contexts. It is very rare for them to visit a health facility for checkups or prevention purposes. This phenomenon can be seen in other countries (23). People living in rural areas prefer to spend their time in employment rather than visiting a health facility (24,25).

Lack of awareness about the Diabetes in rural areas is particularly problematic since it could delay diagnosis and early onset of complications. Therefore public awareness-raising and training for healthcare staff was instigated between 2005–2008 in two rural areas (Kediri City and Kediri Regency) to improve healthcare workers' ability to meet patients' needs. Social educators and health workers were trained and established diabetes awareness information posts in 26 districts (26,27).

Since 2010 the Ministry of Health in collaboration with The Indonesian Endocrinology Society (*Perkeni*) and with the World Diabetes Fund (WDF) has implemented a series of programs addressing challenges in diabetes management. To address the human resource capacity gap, awareness-raising, and educational activities for community members, the program comprised of training master level staff, nurses, educators, patients, and their relatives in diabetes management took place between 2011 and 2014. A community-based approach in the provinces of West Sumatra, Bengkulu, and Banten was developed to reduce the prevalence of NCDs and their risk factors with the main aims to provide early detection, counseling, and education for people with or at risk of developing NCDs (26,27)

This analysis shows diabetes-related diagnoses patients with low education in rural areas have the highest risk for CMD which could hamper their adherence to diabetes treatment regimens. This result implies that tailoring mental health services in diabetes as well as other NCD treatment from the early stages should be a high priority, especially in the outer Jawa Bali region. Mental health service provision in community health services remains a challenge for the Indonesian health system since the budget allocation should compete with other health priorities in maternal and child health. However, since Indonesia currently faces a triple burden of disease with the rising of NCDs including diabetes and mental health, this is the appropriate time for health policymakers to consider tailoring mental health services for diabetes and other NCD treatment. Meanwhile, the lowest risk of CMD among diabetes without complication patients with low education in urban contexts provides an opportunity for the health provider to deliver education on complication prevention.

Lower risk of CMD among diabetes patients with higher education both in rural and urban is in line with other studies. Those with good education have better health literacy including access to information and health service. Therefore, good mental health support would assist in maintaining their adherence to treatment regimens to prevent complications. Once complications took place, more intensive mental health support should be strengthened since a higher risk for CMD could reduce their treatment compliance.

Tailoring mental health services for NCD patients was among WHO recommendations. Among which is mental health screening in diabetes and NCD management in general (28). Although Indonesian health priorities are still in Maternal and Child Health (MCH) and infectious diseases, change of population structure marked by the increasing prevalence and cost of chronic diseases, policy on NCD management began to be developed and implemented, especially prevention, early detection, and screening. Universal health insurance required that NCD management as one of the health system performance indicators focusing on prevention. Routine screening programs should be implemented in primary care known as *posbindu(Pos Binaan Terpadu/* . But its implementation depends on district resources and capability. Mental health is one of 10 main services in community health; however, to date the service is only available in Java regions with lots of challenges.

Policy and strategy to address diabetes

Indonesia released its first diabetes program at the National Congress of PERKENI (Indonesian Endocrinology Society) in July 2012. The program included a variety of stakeholders involved in diabetes management and focused on prevention and increasing the capacity for diagnosis and management of diabetes. An extensive training program for doctors in the field of diabetes was currently running as well (26,27).

Conclusion

The analysis of the latest 2018 Indonesian community health survey revealed urban rural and education differences indeed are risks of developing Common Mental Disorders among diabetics. Almost 20% of diabetes patients have CMD which can worsen treatment compliance and self-care if not properly addressed. Meanwhile, several programs to address diabetes including prevention with a healthy lifestyle and diet are implemented. Since CMD can worsen treatment adherence and self-care among diabetics, it is time for health providers and facilities to perform mental health screening among diabetic and NCD patients in general to prevent treatment in compliance which can lead to complications.

Limitations

Diabetes and comorbid conditions in this analysis obtained from ever diagnosed by the doctor. The estimation could be under-reported especially in the rural or remote area and places with limited resources mostly located in outer big cities or outer Java Bali regions. Since doctors are often only available in big or urban cities. However, the results on the importance of tailoring mental health service in diabetic treatment regimens should receive important consideration among health policymakers and specialists.

Declarations

Ethics approval

Ethical consideration Ethics and permissions for conducting this study followed the Ethical Approval for RISKESDAS 2018 from *Komisi Etik Penelitian Kesehatan, Badan Penelitian dan Pengembangan Kesehatan* (Ethical Committee of Health Research, NIHRD, Ministry of Health, Republic of Indonesia) No. LB.02.01/2/KE.267/2017

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article and its supplementary files. The data that support the findings of this study are available from Data Management Laboratory of National Institute of Health Research and Development (NIHRD), Ministry of Health of Indonesia. Data can be made available after approval of a written request to the Data Management Laboratory—NIHRD at

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Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SI set up the conceptual framework, study design, definition of intellectual contents, literature search, data acquisition, data analysis, statistical analysis, manuscript preparation, manuscript editing and manuscript review. RM co-designed the study, reference collection, statistical analysis, background, results. SS, SI, LM reference collection, background, discussion. The manuscript was read and approved by all the authors.

References

1. Sunny AK, Khanal VK, Sah RB, Ghimire A. Depression among people living with type 2 diabetes in an urbanizing community of Nepal. PLoS One. 2019 Jun 1;14(6).

2. Lin X, Xu Y, Pan X, Xu J, Ding Y, Sun X, et al. Global, regional, and national burden and trend of diabetes in 195 countries and territories: an analysis from 1990 to 2025. Sci Reports 2020 101 [Internet]. 2020 Sep 8 [cited 2021 Aug 29];10(1):1–11. Available from: https://www.nature.com/articles/s41598-020-71908-9

3. Mboi N, Murty Surbakti I, Trihandini I, Elyazar I, Houston Smith K, Bahjuri Ali P, et al. On the road to universal health care in Indonesia, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2018 Aug 18;392(10147):581–91.

4. Jung A, Du Y, Nübel J, Busch MA, Heidemann C, Scheidt-Nave C, et al. Are depressive symptoms associated with quality of care in diabetes? Findings from a nationwide population-based study. BMJ Open Diabetes Res Care [Internet]. 2021 Mar 1 [cited 2021 Aug 10];9(1):e001804. Available from: https://drc.bmj.com/content/9/1/e001804

5. Herrman H, Kieling C, McGorry P, Horton R, Sargent J, Patel V. Reducing the global burden of depression: a Lancet–World Psychiatric Association Commission. Lancet [Internet]. 2019 Jun 15 [cited 2021 Aug 29];393(10189):e42–3. Available from: http://www.thelancet.com/article/S0140673618324085/fulltext

6. Chireh B, Li M, D'Arcy C. Diabetes increases the risk of depression: A systematic review, meta-analysis and estimates of population attributable fractions based on prospective studies. Prev Med Reports [Internet]. 2019 Jun 1 [cited 2021 Aug 10];14:100822. Available from: /pmc/articles/PMC6378921/

7. Wright J, Mazumdar P, Barua D, Lina S, Bibi H, Kanwal A, et al. Integrating depression care within NCD provision in Bangladesh and Pakistan: a qualitative study. Int J Ment Heal Syst 2020 141 [Internet]. 2020 Aug 11 [cited 2021 Aug 10];14(1):1–13. Available from: https://link.springer.com/articles/10.1186/s13033-020-00399-y

8. Verma M, Grover S, Tripathy JP, Singh T, Nagaraja SB, Kathirvel S, et al. Co-existing Non-communicable Diseases and Mental Illnesses Amongst the Elderly in Punjab, India. Eur Endocrinol [Internet]. 2019 Sep 1 [cited 2021 Aug 10];15(2):106. Available from: /pmc/articles/PMC6785953/

9. Bastelaar KMP Van, Pouwer F, Geelhoed-Duijvestijn PHLM, Tack CJ, Bazelmans E, Beekman AT, et al. Diabetes-specific emotional distress mediates the association between depressive symptoms and glycaemic control in Type 1 and Type 2 diabetes. Diabet Med [Internet]. 2010 Jul 1 [cited 2021 Aug 11];27(7):798–803. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/j.1464-5491.2010.03025.x

10. Udedi M, Pence BW, Stewart RC, Muula AS. Detection and prevalence of depression among adult type 2 diabetes mellitus patients attending non-communicable diseases clinics in Lilongwe, Malawi. Int J Ment Heal Syst 2020 141 [Internet]. 2020 Nov 4 [cited 2021 Aug 10];14(1):1–8. Available from: https://link.springer.com/articles/10.1186/s13033-020-00413-3

11. Valladares-Garrido MJ, Soriano-Moreno AN, Rodrigo-Gallardo PK, Moncada-Mapelli E, Pacheco-Mendoza J, Toro-Huamanchumo CJ. Depression among Peruvian adults with hypertension and diabetes: Analysis of a national survey. Diabetes Metab Syndr Clin Res Rev. 2020 Mar 1;14(2):141–6.

12. Arifin B, van Asselt ADI, Setiawan D, Atthobari J, Postma MJ, Cao Q. Diabetes distress in Indonesian patients with type 2 diabetes: a comparison between primary and tertiary care. BMC Heal Serv Res 2019 191 [Internet]. 2019 Oct 30 [cited 2021 Aug 11];19(1):1–11. Available from: https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-019-4515-1

13. Arifin B, Probandari A, Purba AKR, Perwitasari DA, Schuiling-Veninga CCM, Atthobari J, et al. 'Diabetes is a gift from god' a qualitative study coping with diabetes distress by Indonesian outpatients. Qual Life Res 2019 291 [Internet]. 2019 Sep 23 [cited 2021 Aug 11];29(1):109–25. Available from: https://link.springer.com/article/10.1007/s11136-019-02299-2

14. Dany F, Dewi RM, Tjandrarini DH, Pradono J, Delima D, Sariadji K, et al. Urban-rural distinction of potential determinants for prediabetes in Indonesian population aged ≥15 years: A cross-sectional analysis of Indonesian Basic Health Research 2018 among normoglycemic and prediabetic individuals. BMC Public Health [Internet]. 2020 Oct 6 [cited 2021 Mar 5];20(1):1509. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-020-09592-7

15. Ganihartono I. Psychiatric Morbidity among Patients Attending the Bangetayu Community Health Centre in Indonesia - Repositori Litbang Kesehatan [Internet]. Buletin Penelitian Kesehatan, 24 (4). ISSN 0125-9695. 1996 [cited 2021 Sep 7]. Available from: http://repository.litbang.kemkes.go.id/1028/

16. Reuter A, Vollmer S, Aiyub A, Susanti SS, Marthoenis M. Mental distress and its association with sociodemographic and economic characteristics: community-based household survey in Aceh, Indonesia. BJPsych Open [Internet]. 2020 Nov [cited 2021 Sep 7];6(6). Available from: https://www.cambridge.org/core/journals/bjpsych-open/article/mental-distress-and-its-association-with-sociodemographic-and-economic-characteristics-communitybased-household-survey-in-aceh-indonesia/3CE75A7EEE938C0307FDD16D70FC5228

17. Mari JDJ, Williams P. A comparison of the validity of two psychiatric screening questionnaires (GHQ-12 and SRQ-20) in Brazil, using Relative Operating Characteristic (ROC) analysis. Psychol Med [Internet]. 1985 [cited 2021 Aug 11];15(3):651–9. Available from: https://www.cambridge.org/core/journals/psychological-medicine/article/abs/comparison-of-the-validity-of-two-psychiatric-screening-questionnaires-ghq12-and-srq20-in-brazil-using-relative-operating-characteristic-roc-analysis/9B93BE6F9FD03C3ABF0DBCF4263B37F9

18. van der Westhuizen C, Wyatt G, Williams JK, Stein DJ, Sorsdahl K. Validation of the Self Reporting Questionnaire 20-Item (SRQ-20) for Use in a Low- and Middle-Income Country Emergency Centre Setting. Int J Ment Heal Addict 2015 141 [Internet]. 2015 Jun 30 [cited 2021 Sep 7];14(1):37–48. Available from: https://link.springer.com/article/10.1007/s11469-015-9566-x

19. Patel V, Araya R, Chowdhary N, King M, Kirkwood B, Nayak S, et al. Detecting common mental disorders in primary care in India: a comparison of five screening questionnaires. Psychol Med [Internet]. 2008 [cited 2021 Aug 11];38(2):221–8. Available from: https://www.cambridge.org/core/journals/psychological-medicine/article/abs/detecting-common-mental-disorders-in-primary-care-in-india-a-comparison-of-five-screening-questionnaires/6A3D009FE4C6B294485B700C2E9BB417

20. Seiglie JA, Marcus M-E, Ebert C, Prodromidis N, Geldsetzer P, Theilmann M, et al. Diabetes Prevalence and Its Relationship With Education, Wealth, and BMI in 29 Low- and Middle-Income Countries. Diabetes Care [Internet]. 2020 Apr 1 [cited 2021 Aug 10];43(4):767–75. Available from: https://care.diabetesjournals.org/content/43/4/767

21. Drewnowski A, Popkin BM. The Nutrition Transition: New Trends in the Global Diet. Nutr Rev [Internet]. 1997 Feb 1 [cited 2021 Aug 29];55(2):31–43. Available from: https://academic.oup.com/nutritionreviews/article/55/2/31/1824117

22. Meliala A, Hort K, Trisnantoro L. Addressing the unequal geographic distribution of specialist doctors in Indonesia: The role of the private sector and effectiveness of current regulations. Soc Sci Med. 2013 Apr 1;82:30–4.

23. Idriss A, Diaconu K, Zou G, Senesi RG, Wurie H, Witter S. Rural–urban health-seeking behaviours for non-communicable diseases in Sierra Leone. BMJ Glob Heal [Internet]. 2020 Feb 1 [cited 2021 Aug 29];5(2):e002024. Available from: https://gh.bmj.com/content/5/2/e002024

24. Chang H, Hawley NL, Kalyesubula R, Siddharthan T, Checkley W, Knauf F, et al. Challenges to hypertension and diabetes management in rural Uganda: a qualitative study with patients, village health team members, and health care professionals. Int J Equity Heal 2019 181 [Internet]. 2019 Feb 28 [cited 2021 Aug 11];18(1):1–14. Available from: https://equityhealthj.biomedcentral.com/articles/10.1186/s12939-019-0934-1

25. Onyeonoro UU, Ogah OS, Ukegbu AU, Chukwuonye II, Madukwe OO, Moses AO. Urban–Rural Differences in Health-Care-Seeking Pattern of Residents of Abia State, Nigeria, and the Implication in the Control of NCDs: https://doi.org/104137/HSIS31865 [Internet]. 2016 Oct 5 [cited 2021 Aug 11];9:9–29. Available from: https://journals.sagepub.com/doi/full/10.4137/HSI.S31865

26. Soewondo P, Ferrario A, Tahapary DL. Challenges in diabetes management in Indonesia: a literature review. Glob Heal 2013 91 [Internet]. 2013 Dec 3 [cited 2021 Aug 11];9(1):1–17. Available from: https://globalizationandhealth.biomedcentral.com/articles/10.1186/1744-8603-9-63

27. Khoe LC, Wangge Id G, Soewondo P, Tahapary DL, Widyahening IS. The implementation of community-based diabetes and hypertension management care program in Indonesia. 2020 [cited 2021 Aug 7]; Available from: https://doi.org/10.1371/journal.pone.0227806

28. Ngo VK, Rubinstein A, Ganju V, Kanellis P, Loza N, Rabadan-Diehl C, et al. Grand Challenges: Integrating Mental Health Care into the Non-Communicable Disease Agenda. PLOS Med [Internet]. 2013 [cited 2021 Aug 11];10(5):e1001443. Available from: https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001443