

# Prevalence of Diabetes Among Community-Living Older Persons in the Philippines: The FITforFrail Study

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## Abstract

**Objective.** To estimate the prevalence of diabetes among Filipino older persons living in the community.

**Methodology.** A cross-sectional analysis was done on a random sample of persons 60 years and older from the Focused Interventions for Frail Older Adults Research and Development Program (2018-2019). A diagnosis of diabetes was established by self-reported physician's diagnosis or if the person was on any antihyperglycemic drugs.

**Results.** The prevalence of self-reported diabetes was 20.5%, with no difference in age, sex, education, or body mass index between older persons with and without diabetes. The presence of 2 or more comorbidities was significantly more common among older persons with diabetes ( $p < 0.001$ ). Visual impairment ( $p < 0.01$ ), hypertension ( $p < 0.001$ ) and hyperlipidemia ( $p < 0.001$ ) were more frequent among those with diabetes.

**Conclusion.** Diabetes is prevalent among community-living older Filipinos. Therefore, effective public health measures for diabetes prevention and management are needed for the ever-growing older population, who are at the highest risk for morbidity and mortality.

**Key words:** diabetes, older persons, comorbidities

## INTRODUCTION

The International Diabetes Federation reports that there is an estimated 536.6 million (10.5%) persons with diabetes between the ages of 20 to 79 in 2021.<sup>1</sup> This is projected to increase to 783.2 million (12.2%) in 2045 with the greatest increase coming from low-and middle-income countries (LMIC). The prevalence increased with age, with the highest seen in the 75 to 79 age group (24%). For those between the ages of 65 to 99 years, the number of persons with diabetes was reported to be 135.6 million (19.3%) in 2019, mostly coming from LMIC and is projected to increase to 276.2 million in 2045.<sup>2</sup>

Diabetes is a significant contributor to death and disability. The 2019 World Health Organization Global Health Estimates ranked diabetes as the 9<sup>th</sup> cause of death and 8<sup>th</sup> cause of disability worldwide.<sup>3</sup> Risk of death increases with age, the pathophysiologic damage of the disease itself and its complications, presence of comorbidities, polypharmacy and even antihyperglycemic drugs.<sup>4-7</sup> Multimorbidity, the presence of two or more diseases in the same person, is commonly seen with diabetes.<sup>8</sup> As much as 97.6% of community-living older persons with

diabetes have at least one comorbid disease and about 46% have 3 or more.<sup>9-11</sup> Persons with diabetes are at high risk for cardiovascular complications, such as hypertension, heart disease, stroke and geriatric syndromes, including falls, cognitive impairment or urinary incontinence.<sup>12,13</sup>

Diabetes impairs an older person's ability to carry out activities important for independent living and social interaction. Disability, in terms of dependence in activities of daily living (ADL), instrumental ADL and physical immobility influence one's quality of life.<sup>14,15</sup> This becomes an added complication to the health-related changes of aging and coexisting health conditions. Furthermore, this also implies an increase in the number of drugs prescribed in a setting with limited financial and social capabilities.

The Philippine population is aging. In 2020, the 60 and older age group accounted for 8.6% of the population and is projected to almost double to 16.5% in 2050.<sup>16</sup> The Philippine Statistics Authority report from January to December 2021 lists diabetes as the 5<sup>th</sup> leading cause of death in the country.<sup>17</sup> There is a lack of epidemiological studies on older persons in the country. Estimating the prevalence of diabetes is of vital importance to the government and health

professionals for planning, allocation of resources and care of older persons with diabetes in the country.

## METHODOLOGY

### Study source and population

This study utilized data collected from the Focused Interventions for Frail Older Adults Research and Development Program (FITforFrail) project. This was a cross-sectional survey conducted in 2018-2019, which aimed to determine the health and frailty status of community-living older persons in the Philippines.<sup>18</sup> Briefly, four communities from four provinces representing four regions in the country – National Capital Region (NCR), Laguna, Cebu and Davao, were included in the study. Selection criteria were as follows: proportion of older persons, number of geriatricians, support from the local government and health department, ease of transportation and communication and safety of the research team. The sample size was computed based on the number of older persons in each region. Oversampling was done to compensate for nonresponse. Eligible subjects included individuals 60 years and older, who lived in the selected community of each province and can communicate and respond to questions. A list of older persons was acquired from the Office of the Senior Citizen Association of each community and field listing was conducted to obtain a wider coverage in the study. The study was approved by the University of the Philippines Manila Research Ethics Board.

### Data collection

The Comprehensive Geriatric Assessment (CGA), which was used in the FITforFrail study, includes an interview phase and a clinical phase consisting of physical, neurological and laboratory examinations. The CGA is a multidisciplinary evaluation program that uncovers, describes and explains multiple problems of older persons while identifying their needs, resources and strengths. The CGA was applied to create a coordinated care plan that focuses interventions on these identified issues.<sup>19</sup> The CGA was translated, pretested and pilot-tested in *Filipino* for use in NCR and Laguna, and in *Bisaya* for Cebu and Davao.

Trained researchers interviewed the participants regarding sociodemographic variables, such as age, sex, marital status, education, physical and psychosocial health, lifestyle behavior, comorbidity, functional status, physical activity and drug use. Body mass index (BMI) was classified as underweight (<18.5 kg/m<sup>2</sup>), normal (18.5 to 22.9 kg/m<sup>2</sup>), overweight (23 to 24.9 kg/m<sup>2</sup>) and obese (≥25 kg/m<sup>2</sup>).<sup>20</sup> History of smoking and alcohol intake were obtained. For self-rated health, participants were asked, "How would you rate your current state of health?: poor, fair, good, very good, excellent." Sleeping problems were assessed by asking the participant, "Have you experienced problems with sleeping such as difficulty falling asleep, waking up frequently at night or waking up early?" Comorbidity was defined as the presence of two or more chronic diseases, classified according to the International

Classification of Diseases (ICD) 10. Drug use was defined as the use of either a prescription drug, over-the-counter drug, herbal preparations or food supplements in the preceding two weeks. The participant or reliable informant was asked to bring the medications and doctor's prescription for verification. Drugs were categorized according to the WHO Anatomic Therapeutic and Chemical (ATC) classification.

### Criteria for the diagnosis of diabetes

Participants were diagnosed with diabetes either through self-reporting or the use of insulin or oral antihyperglycemic agents. Self-report was elicited by asking the older person whether they have been told to have diabetes by a physician in the past. The type of diabetes was not taken into account. Other health conditions were also identified.

### Statistical analysis

Descriptive statistics were used to summarize the socio-demographic and clinical profile of the study participants. Normally distributed variables were expressed as mean ± standard deviation (SD) while variables with non-normal distribution were expressed as median and interquartile range (IQR). Categorical variables were expressed as percentages. Point and 95% confidence interval estimates of the prevalence of diabetes among community-living older persons in the Philippines were computed. Pearson's chi-square test or Fisher's exact test was used to test for differences between proportions, while Student's t test or Mann-Whitney U test was used to compare means or medians. The statistical significance was set at  $p < 0.05$ . Statistical analyses were performed using STATA v15.1.

## RESULTS

Out of 424 eligible older persons in the target communities, 405 completed the CGA, which translated to a response rate of 95.5%. The ages ranged from 60 to 99 years, with a median of 68 years. Majority were female (63.9%). There was no significant difference in terms of age ( $p=0.866$ ), sex ( $p=0.798$ ) and education ( $p=0.124$ ) between persons with self-reported diabetes diagnosis and those who were identified to have diabetes based on antihyperglycemic drug use.

Table 1 describes the sociodemographic characteristics of the participants. The prevalence of diabetes was 20.5%, 95% CI [16.7, 24.8], and was highest in the 60 to 69 age group (63.9%). No statistical differences were noted between older persons with and without diabetes with regards to age ( $p=0.404$ ), sex ( $p=0.703$ ), civil status ( $p=0.064$ ), and education ( $p=0.109$ ). According to location, there were significantly more older persons with diabetes from Cebu ( $p<0.01$ ) and Laguna ( $p<0.01$ )

Persons with and without diabetes were comparable with regards to smoking ( $p=0.211$ ), exercise ( $p=0.852$ ), BMI ( $p=0.167$ ), and sleep problem ( $p=0.389$ ). Majority of persons with and without diabetes reported poor

**Table 1.** Sociodemographic characteristics of community-living Filipino older persons by diabetes status

	With diabetes N=83, % (95% CI)	Without diabetes N=322, % (95% CI)	p value
Age			0.404
60-69	63.9 (52.6, 74.1)	56.2 (50.6, 61.7)	
70-79	26.5 (17.4, 37.3)	30.1 (25.2, 35.5)	
80+	9.6 (4.2, 18.1)	13.7 (10.1, 17.9)	
Female	66.3 (55.0, 76.3)	64.0 (58.5, 69.2)	0.703
Location			0.005
NCR	21.7 (29.2, 51.1)	29.2 (16.8, 26.0)	
Laguna	28.9 ( )	33.2 (12.6, 21.0)	
Cebu	39.8 (13.4, 32.1)	29.2 (24.5, 34.5)	
Davao	28.9 (19.5, 39.9)	33.2 (28.1, 38.7)	
Civil status			0.064
Single <sup>a</sup>	38.6 (28.1, 49.9)	50.6 (45.0, 56.2)	
Married	61.4 (50.1, 71.9)	49.4 (43.8, 55.0)	
Education			0.109
Elementary <sup>b</sup>	27.7 (18.4, 38.6)	40.1 (34.7, 45.6)	
High school <sup>c</sup>	34.9 (24.8, 46.2)	28.0 (23.1, 33.2)	
College <sup>d</sup>	37.4 (27.0, 48.7)	32.0 (26.9, 37.4)	
Pension			0.900
Yes	41.0 (30.3, 50.2)	39.8 (34.4, 45.4)	
No	71.2 (60.1, 80.5)	60.2 (54.7, 65.6)	
Financial support			0.305
Yes	81.9 (72.0, 89.5)	76.1 (69.1, 78.9)	
No	18.1 (10.5, 28.0)	23.9 (19.4, 29.0)	

a – includes separated and widowed; b – includes no education; c – high school and vocational course; d – college and postgraduate

to fair self-rated health (93.7% and 83.7% respectively) (Table 2). Approximately half the study population were obese (51.5%) while 48.5% were non-obese. For persons with diabetes, the median number of comorbidities was 4, while among those without diabetes, the median number was 2 ( $p<0.001$ ). Those without diabetes were also less likely to drink alcohol ( $p<0.05$ ).

Persons with diabetes were more likely to have visual impairment ( $p<0.001$ ), hypertension ( $p<0.01$ ), and hyperlipidemia ( $p<0.001$ ) than those without diabetes (Table 3). The most common comorbidity was visual impairment (61.5%), which included the following: error of refraction (60.2%), cataract (22.9%), diabetic retinopathy (8.4%), glaucoma (3.6%), and hypertensive retinopathy (1.2%). Sub-analysis of each condition revealed no significant difference between the two groups. Hyperuricemia, cerebrovascular disease and urinary tract infection were also more common among those with diabetes but these findings did not reach statistical significance. The most common coexisting conditions among those with diabetes were hypertension and visual impairment (56.6%), hypertension and hyperlipidemia (45.8%), and hyperlipidemia and visual impairment (42.2%).

## DISCUSSION

We aimed to estimate the prevalence and determinants of diabetes among the community-living older persons in the Philippines. This is particularly important because of the continuously increasing prevalence of diabetes and its complications, the increased risk of mortality and disability from diabetes, and the steadily increasing aging population.

**Table 2.** Clinical and behavioral characteristics of community-living Filipino older persons by diabetes status

	With diabetes N=83, % (95% CI)	Without diabetes N=322, % (95% CI)	p value
Smoking history			0.211
Non-smoker/previous	65.1 (53.8, 75.2)	56.8 (51.2, 62.3)	
Current	34.9 (24.8, 46.2)	43.2 (37.7, 48.8)	
Alcohol consumption			0.035
Non-drinker/previous	53.0 (41.7; 64.1)	40.1 (34.7, 45.6)	
Current	33.7 (35.9; 58.3)	59.9 (54.4, 65.3)	
Exercise			0.852
Yes	85.5 (76.1, 92.3)	86.3 (82.1, 89.9)	
No	4.5 (7.7, 23.9)	13.7 (10.1, 17.9)	
Comorbidities			0.002
0	4.8 (1.3, 11.9)	13.4 (9.8, 17.6)	
1	8.4 (3.5, 16.6)	19.6 (15.4, 24.3)	
2+	86.7 (77.5, 93.2)	67.1 (61.6, 72.2)	
BMI			0.167
Underweight	7.4 (2.0, 13.5)	15.6 (10.4, 18.4)	
Normal	41.2 (23.7, 45.0)	33.6 (25.2, 35.4)	
Overweight-Obese	51.5 (31.4, 53.5)	50.9 (40.1, 51.3)	
Sleep problem			0.389
Yes	6.6 (45.23, 67.5)	50.6 (45.0, 56.2)	
No	43.4 (32.5, 54.7)	49.4 (43.8, 54.2)	
Self-rated health			0.061
Poor – fair	93.6 (84.5, 98.2)	83.7 (78.1, 88.1)	
Good – excellent	6.4 (1.8, 15.5)	16.3 (11.6, 22.9)	

**Table 3.** Most common comorbidities ( $\geq 5\%$ ) of community-living Filipino older persons by diabetes status

	With diabetes N=83, % (95% CI)	Without diabetes N=322, % (95% CI)	p value
Visual impairment	71.1 (60.1, 80.5)	57.4 (51.8, 62.9)	<0.01
Hypertension	73.5 (62.7, 82.6)	52.2 (46.6, 47.7)	<0.001
Hyperlipidemia	53.0 (41.7, 64.1)	16.5 (12.6, 21.0)	<0.001
Hyperuricemia	19.3 (11.4, 29.4)	14.3 (10.6, 18.6)	0.304
Arthritis	16.9 (9.5, 26.7)	17.1 (13.1, 21.64)	0.877
Urinary tract infection	14.5 (7.7, 23.9)	11.2 (8.0, 13.1)	0.446
Cerebrovascular disease	13.3 (6.8, 22.5)	7.5 (4.8, 10.9)	0.122
COPD	6.0 (2.0, 13.5)	8.4 (5.6, 12.0)	0.511
Vertigo	2.4 (0.3, 8.4)	6.5 (4.1, 9.8)	0.189
Anemia	6.0 (2.0, 13.5)	4.4 (2.4, 7.2)	0.560

COPD – asthma and chronic bronchitis; hyperuricemia – includes gout; visual impairment – error of refraction, use of glasses and reading aids, cataract, diabetic and hypertensive retinopathy

Comparison with other studies may be challenging because of methodological differences in diabetes ascertainment and data collection, socioeconomic factors, age distribution and setting.<sup>21,22</sup> In this study, the prevalence of diabetes was 20.5%, which is consistent with the IDF worldwide prevalence of 19.3%.<sup>1</sup> Our result is also well within the range of the report from the 10/66 Dementia Research Group study which showed that the prevalence of diabetes among persons 65 years and older in rural and urban areas ranges from 0.9% in rural China to 32.1% in Puerto Rico.<sup>21</sup> Among neighboring Asian countries, the prevalence of diabetes among those 60 years and older in the Malaysian 2011 National Health and Morbidity Survey was 34.4%, and in the Indonesian Family Life Survey was 6.3%.<sup>23,24</sup> In the UP Wellness Initiative for Seniors and Elders study, which included those 55 years and above, 17.6% of the participants were reported to have diabetes based on diagnoses by geriatricians and fasting blood sugar levels.<sup>25</sup>

In this study, diabetes prevalence increased with age, peaking in the 70 to 79 age group, followed by a decrease in the oldest old (80 years and above). Similar findings were observed in the 10/66 study on the prevalence of diabetes in LMICs and also in the Canadian Study on Health and Aging, showing a similar peak in diabetes among those ages 75 years and above.<sup>21,26</sup>

In a study done on the natural history of prediabetes by Shang et al., most of the older adults with prediabetes reverted to normoglycemia. This was most evident in the oldest age group (81 years and above) and was associated with weight loss and lower systolic blood pressure.<sup>27</sup>

Persons with diabetes had significantly greater comorbidities than those without diabetes, consistent with previous reports.<sup>9,14,28,29</sup> This has been attributed to the effect of longstanding hyperglycemia and insulin resistance on several organ systems, particularly on the microvasculature and immune response.<sup>30,31</sup> Hypertension, hyperlipidemia, hyperuricemia and cerebrovascular disease were more common among those with diabetes consistent with findings from other studies.<sup>28,29,32</sup> These conditions are directly related to the pathophysiology of diabetes. We also found visual impairment to be more common among persons with diabetes. This was consistent with the findings from a nationally representative sample of the 60-year-old and higher age group in the US.<sup>14</sup> It is important to recognize the greater burden these comorbidities place on the person with diabetes as a result of a more complicated treatment regimen, an increased risk of morbidity and mortality, increased health care utilization and cost, and a poor quality of life.<sup>9-11</sup>

Our findings add to existing literature that showed mixed results in terms of sex, education and BMI. Our results found no difference between sexes as reported in other studies.<sup>9,32-34</sup> A review on the association of socioeconomic status and type 2 diabetes risk showed that minimal educational attainment was highly associated with increased risk of diabetes, which was not seen in our study.<sup>35</sup> With regards to BMI, obesity is considered a significant risk factor for type 2 diabetes.<sup>36,37</sup> Consequently, diet and exercise were recommended to aid in controlling diabetes. In this study, we found comparable proportions of obese/overweight and non-obese (normal/underweight) persons with diabetes. A report consistent with our findings was seen in a study in Japan where more than 60% had non-obese diabetes.<sup>38</sup> In the DECODE-DECODA study, ethnicity played a role in diabetes susceptibility. Results showed that the diabetes risk among Asians was higher at a lower BMI.<sup>39</sup>

To our knowledge, this is the first study to estimate the prevalence of diabetes among persons aged 60 years and older in the country. The response rate of 90.5% allows our study findings to be generalized among similar-aged persons living in a community.

Limitations in our study include the cross-sectional study design which may increase survival bias. The use of self-reported doctor's diagnosis to determine diabetes may introduce misclassification bias leading to an incorrect estimate of the prevalence. However, studies have shown that there is substantial agreement when self-report was compared with medical or administrative records.<sup>40,41</sup> Moreover, our findings on the prevalence of diabetes were within the range of estimates from other studies.<sup>21</sup>

The prevalence of diabetes among community-living older persons is 20.4%. There was a higher burden of comorbidities among persons with diabetes and the most common were hypertension, visual impairment and hyperlipidemia. Effective public health measures for diagnosis and prevention are needed to manage diabetes in the older population. Future research may examine the influence of diabetes and its comorbidities and its impact on the use of available resources.

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#### Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

#### Author Contribution Statement

MTG and SDV conceived the study, developed the methodology, validated the research outputs, synthesized the study data, conducted the research, provided the study materials, reviewed and edited the manuscript, and supervised the research activity planning. MTG curated and presented the data and prepared the original draft. SDV coordinated the research activity planning and acquired financial support for the study.

#### Author Disclosure

All authors declared no conflict of interest.

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