# Co-morbidities and associated factors among elderly Malaysians

## Dr.TheingiMaung Maung[1], Dr.HninPwint Phyu[2]

[1](Unit of community Medicine, AIMST University, Malaysia)
[2](Pre-clinical Unit,UniversitiTunku Abdul Rahman,Malaysia)
Corresponding Author: Dr.TheingiMaung Maung

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**Abstract:** The world population isageing and thisproblemisemerging over the past few years and itisexpected to be a major issue in the near future. The older population isdefined as thosewhoaged over 60 yearsold.This studyaimed to investigate the association betweenselected variables and comorbidityamongelderly population who are residing in health-care facilities in Selangor, Malaysia. The selected variables are gender, educationallevel, body mass index and quality of life.Cross-sectional studywascarried out, involving 141 participants from four health care facilities.The quality of life of the elderlywasmeasuredbased on WHOQOL-BREF questionnaire.The prevalence of comorbidityamong the participants were 65.9%. This studyfoundthatelderlywithhigher BMI has an increaserisk of gettingcomorbidity.

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## I.    Introduction

The world population is ageing and this problem is emerging over the past few years and it is expected to be a major issue in the near future. The older population is defined as those who aged over 60 years old. There are several factors leading to the increase in ageing population globally which include the increase in life expectancy, decreased fertility rate, the advancement in medical field and the increase in education standard worldwide.

The estimated Malaysian elderly today who aged 60 years and above is 1.4 million and this number is expected to increase to 3.3 million I another 4 years. In addition, there was a significant increase in the population aged 60 years and above over the years. Data has shown that the percentage was 5.2% in 1970, 5.7% in 1990 and 6.3% in the 2000. The percentage is projected to increase to roughly 9.8% of the overall population in the year of 2020. Multiple factors have been identified in affecting the health status and daily living of the elderly, therefore the increase in aged group proportion is accompanied by the increase in the prevalence of ill health.

Comorbidity or multiple morbidities is defined as presence of two or more diseases at the same time among individual. It will lower down health status, lead to more complex clinical management and increase in healthcare cost. Comorbidity is common among elderly population and studies have shown that the prevalence rate of comorbidity in the elderly ranges from 55 to 98 % (Marengoni et al. cited inMartin Scherer et al. 2010). 76% of the patients have the tendency to develop three or more chronic conditions (Fortin et.al cited inIngmar Schäfer et al. 2010).

Hypertension was described as a worldwide epidemic. Its epidemiological data was studied in detail internationally. The prevalence of hypertension was 51% in the 60-74 years old age group in  2014 (Medscape 2014). A research from China has shown that the prevalence of hypertension in Asia had increased significantly from 60% to 65.2% from the year 2001 to 2010 (Wu L, et al. 2015). In Malaysia, the overall prevalence among elderly were 74%, more in elderly female(77.4%) than men (70.1%) based on the analysis of secondary data from a cross-sectional national population based surveyconducted from April to August 2006 throughout Malaysia under National Health and Morbidity Survey III(NHMS III)(Ho Bi Kiau, 2013).

Besides that, approximately 80% of all deaths from coronary heart disease (CHD) occur in elderly older than 65 years and it is the leading cause of death in this age group.Hyperlipidemia prevalence for elderly who are 65 years and above was highest among Asian/ Pacific Islander beneficiaries (50.1%), followed by non-Hispanic White (48.4%), African American (45.7%), Hispanic (45.6%), and American Indian/ Alaska Native (37.0%) beneficiaries (Centers for Medicare & Medicaid Services 2016). Studies in Malaysia are supported by the Fifth Edition of the National Health and Morbidity Survey (National Health Morbidity Survey IV cited in SheaminiSivasampu, Shanta Kumar. C & Kim KaKeat 2012) which stated that there were more undiagnosed cases of hyperlipidemia (33.8%) than those diagnosed cases of hyperlipidemia (21%).

A study in America has shown that 11.8 million people were suffering from diabetes mellitus among the elderly population, which is around 25.9% of the total elderly population in America. (American Diabetes Association, 2015).In between 2001 and 2010, a study in china stated that the prevalence of diabetes among

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elderly were 21.4% and 24.8% respectively. In the study 73.6% of diabetic people were aware of their condition. (Liu et al. BMC Public Health, 2016).

There is a prevalence of 70-75% cardiovascular disease among American elderly, including hypertension, congestive heart diseases, heart failure, and stroke among elderly of age 60-79 years and 79-86% among those aged 80 years or older. (Yazdanyar and Newman, no date).The prevalence of cardiovascular disease in Australia has increased to 23% for those aged 45 to 54 years old and 63% for those aged 75 years and older. (Australia and Statistics 2016).The prevalence of heart disease in older Japanese adults aged more than 65 years was 2238 cases, 10.7%. (Hayashi et al. 2016). In Malaysia, the prevalence of previous history of coronary artery disease, myocardial infarction/heart failure were all significantly higher among elderly patients as compared to non-elderly patients. (Ahmad SyadiMahmoodZuhdi et. al. 2016). The prevalence of ischemic heart disease was high among elderly who were aged between 75-79 years old which is 19.2% in Malaysia. (SandheepSugathan et. al. 2013).

One of the studies in Spain showed that 67.5% of the elderly patients had two or more chronic diseases simultaneously, this rate being even higher in women (69.3%) (José María Abad-Díez et al. 2014). As for Malaysia, older females were more likely than males to have arthritis and hypertension, but males were more likely to have asthma. (Jane K. L., Nai Peng Tey& Sor Tho Ng 2014).

The Body Mass Index seems to related to comorbidity as stated in an Italian research paper published in 2013. The age specific proportion of females with 2 or more diseases is 0.45 as compared to the males which is 0.35 at the age of 65 years old. It shows that female elderly has a slightly higher prevalence in getting multiple diseases compared to male elderly of the same age (Rocco Micciolo, 2013).

A study in 2012 suggested that there is a relationship between low quality of life score and the presence of musculoskeletal disorders, low vision and hearing impairment. However, association is not found between hypertension, diabetes and quality of life in the study. (Ganesh Kumar S. et al. 2012) Another study conducted in 2014 showed that elderly who are having greater comorbidity index had lower quality of life measures. 3.7 decreases and 3.6 decreases over 100 were found in generic quality of life and in older-specific quality of life respectively. The measures were converted to a range of 0-100 for description and comparison purposes. (Yukari Yamada et al. 2014).

Individuals who had an educational level lower than college tend to have a higher tendency of developing chronic diseases; the odds of these prevalent disease conditions appeared to be inversely proportional to educational level (Andy I. Choi et al. 2011). People who are highly educated will be aware of their own health as they are better in managing these chronic diseases (William W Hung et al. 2011).Another European studies showed that the prevalence of diabetes, cardiovascular disease, COPD and depression is lower in people with higher levels of education as compared with people with a lower level of education (Harbers MM, Achterberg PW 2012). In Malaysia, elderly with higher educational levels could have better awareness of health and be more actively involved in activities such as reading and writing in order to stimulate their brain more so to prevent cognitive impairment (Thant Zin et al. 2011).

In Malaysia, there are not sufficient data for comorbidity in Selangor as well as other states in Malaysia currently.The relevant information and data are still lacking on this issue especially those who are staying in health care facilities with clinical problems. The aim of this study is to determine the prevalence of comorbidity among elderly residing at healthcare facilities in Klang Valley Selangor, which is influenced by gender, educational level, Body Mass Index and the quality of life.

## II. Material And Methods

**Study design**
Cross-sectional study was carried out both analytically and descriptively in the Selangor State, Malaysia.

**Study area**
The participants in this study are elderly population residing at different health care facilities in KlangValley area, Selangor. Altogether seven healthcare facilities involved in this study.

**Study duration**
At least one pre-visit is carried out for every healthcare facility to evaluate the capability of the elderly to be involved in the survey. The survey is carried out from January to September 2016.

**Study population**
Elderly people residing at seven health care facilities of Selangor,Malaysia

**Sampling and sample size**
Universal sampling method is used and the sample size for this study is 141. The inclusion criteria in this study are elderly with age 60 years and above and elderly who resides at the 7 healthcare facilities in Klang Valley are. The exclusion criteria are elderly younger than 60 years old, those who do not have consent and critically ill and thoseelderly residing other than selected facilities.

**Variables**

The dependent variables in this study are gender, Body Mass Index and educational level. The independent variables include comorbid diseases like hypertension, diabetes mellitus, joint pain, Alzheimer and dyslipidemia. The only exception is the quality of life which is the dependent variable when the independent variable is the presence of comorbid diseases.

**Study tools and methods of measurement**

The measurement of hypertension is done using the manual sphygmomanometer and stethoscope. The average of two readings of the measurement is recorded and the measurements for all the elderly in one home are taken by the same personnel throughout the process to ensure the consistency of the results. The same height (m) and weighing (kg) machine is used to measure the Body Mass Index of the elderly. Physical examination is done on each elderly individual to detect any abnormalities of the body. The waist, mid-arm and calf measurements (cm) are measured using the same measuring tape for all the elderly. The quality of life of the elderly is measured through the generic quality of life scale developed by the World Health Organization (WHOQOL-BREF). It is based on a structure that consists of four domains which are physical health, psychological, social relationship and environment. Each domain is given a scoring at the end of the assessment. There is a scoring method for the Activities of Daily Living with a total of 5 marks. It consists of 5 questions and one mark is given to each activity the participant is able to perform. The recall bias is avoided by asking the participants about the recent activities within 3 months. For instance, participants were asked for the social activities they do 3 months ago. Students are well-trained before performing the measurements to avoid measurement bias.

**Statistical analysis**

All the data collected are recorded and analyzed using the SPSS software version 23. The findings are organized and presented using charts and diagrams. Chi-square test and t-test are used to prove the outcomes.

## III. Result

1.**Social demographic background**

There are 141 participants in total involved in this study after excluding those who are not fit under the inclusion criteria. The social demographic factors involved are age, ethnicity, gender, educational level and location. The average age of participants in this study is 76.92 (Standard deviation + 9.139). Female has a higher proportion (66.2%) than male (33.8%). Most of the participants were Chinese (97.1%) and others ethnicity involved were only 2.8%. For the educational level, there are 57.4% of participants had never attended school or only attended primary school, another 42.6% of them had higher educational level which are secondary, university level or attended night school (part time degree or diploma level).

**2 Prevalence of comorbidity**

There was a higher prevalence in elderly who has comorbidity (those who have 2 or more than 2 diseases) which is 65.9% than those elderly who have no comorbidity which is 34.1%.

**3.Distribution of Comorbid diseases**

Regarding the distribution of comorbid diseases, 56.3% of the elderly have less than 3 diseases which is higher compared to those who have more than or equal to 3 diseases (43.7%). Table1 shows the prevalence of comorbidity among elderly in this study. Hypertension was shown to be the most common comorbid disease among the elderly and has a prevalence of 52.4%, followed by diabetes Mellitus, joint pain, Alzheimer's disease and hyperlipidemia which have a prevalence of 29.4%, 27.8%, 19.8% and 15.1% respectively.

**Table 1:** Descriptive analysis of prevalence of comorbid diseases

| Comorbid diseases | Valid | Prevalence n (%) |
|---|---|---|
| **Hypertension** | 126 | |
| Yes | | 66 (52.4%) |
| No | | 60 (47.6%) |
| | | |
| **Diabetes Mellitus** | Valid | |
| Yes | 126 | 37 (29.4%) |
| No | | 89 (70.6%) |

| Joint Pain | Valid | |
|---|---|---|
| Yes | 126 | 35 (27.8%) |
| No | | 91 (72.2%) |
| | | |
| Alzheimer | Valid | |
| Yes | 126 | 25 (19.8%) |
| No | | 101 (80.2%) |
| | | |
| Hyperlipidemia | Valid | |
| Yes | 126 | 19 (15.1%) |
| No | | 107 (84.9%) |

### 4. Activities of Daily Living

**Table 2:** Combined table for activities of daily living

| Able to get onto and out of bed without help | |
|---|---|
| Yes | 99 (76.7%) |
| No | 30 (23.3%) |
| | |
| **Able to perform daily grooming without help** | |
| i) Getting to toilet | |
| Yes | 95 (73.6%) |
| No | 34 (26.4%) |
| ii) Bathing / Showering | |
| Yes | 88 (68.2%) |
| No | 41 (31.8%) |
| | |
| iii) Changing Clothes (Dressing Self) | |
| Yes | 99 (76.7%) |
| No | 30 (23.3%) |
| iv) Able to take meals without assistance | |
| Yes | 119 (92.2%) |
| No | 10 (7.1%) |
| | |
| **ADL Score (out of 5) mean(SD)** | 3.83(1.77) |

The activities of daily living are shown in table (2). 92.2% of the participants are able to take meals without assistance while only 7.1% of the participants need assistance for taking meals. Besides that, 76.7% of the participants are able to get onto and out of bed without help and also able to change clothes on themselves. The remaining 23.3% of participants need help in getting onto and out of bed as well as changing clothes. There is 26.4% of participants needing help in getting to toilet and 31.8% of participants need help in taking bath. The mean of total ADL score is 3.83(1.77).

### 5. Social Demographic Factors vs Comorbidity
#### 5.1. Gender and Comorbidity
Table 3 shows the association between gender and comorbidity. Gender is not statistically related to comorbidity, showing chi-square value 0.064 and p-value>0.05.

**Table 3:** Association between Gender and comorbidity

| | Comorbidity | | | | | |
|---|---|---|---|---|---|---|
| | Yes (>=2 diseases) | No (<2 diseases) | | | | |
| Gender | n(%) | n(%) | df | $\chi^2$ | p-value | POR |

| | | | | | | |
|---|---|---|---|---|---|---|
| Female | 54 (66.7%) | 27 (33.3%) | | | | |
| Male | 29 (64.4%) | 16 (35.6%) | 1 | 0.064 | 0.801 | 1.103 |

## 5.2. Educational level and Comorbidity
The association between educational level and comorbidity is shown in Table 4. Result shows that education level does not depend on comorbidity with chi-square value 1.414 and p-value>0.05.

**Table 4:** Association between Educational level and comorbidity

| | Comorbidity | | | | | |
|---|---|---|---|---|---|---|
| Education level | Yes (>=2 diseases) n(%) | No (<2 diseases) n(%) | df | χ2 | p-value | POR |
| Never Attended School/Primary | 44 (62.9%) | 26 (37.1%) | | | | |
| Secondary/University/Night School | 38 (73.1%) | 14 (26.9%) | 1 | 1.414 | 0.234 | 1.604 |

## 5.3. BMI and Comorbidity
Table 4.8 shows that mean of BMI among elderly who have comorbidity is 23.15 (SD + 5.09) as compared to those without comorbidity 21.08 (SD + 4.62). There is significant difference in average BMI in between the two groups with significant p-value <0.05 and confidence interval (0.15, 3.99). Those with two or more diseases have significantly higher BMI than those elderly with less than two diseases.

**Table 5:** Association between BMI and comorbidity

| | Comorbidity | | | | |
|---|---|---|---|---|---|
| BMI | Yes (>=2 diseases) n(%) | No (<2 diseases) n(%) | 95% CI | t-value | p-value |
| Mean(SD) | 23.15(5.09) | 21.08(4.62) | 0.15 to 3.99 | -2.137* | 0.035 |

\* Independent t-test was performed, Level of significant at p < 0.05, CI=Confidence Interval

## 5.4. Quality of Life and Comorbidity
**Table6**. Association between Comorbidity and All Four Domains of QoL

| | Comorbidity | | | | |
|---|---|---|---|---|---|
| QOL score | Yes (>= 2 diseases) | No (<2 diseases) | 95% CI | t-value | p-value |
| (i) Physical Health Domain mean(SD) | 54.05 (13.07) | 51.08 (12.29) | -1.958 to 7.901 | 1.193* | 0.235 |
| (ii) Psychological Domain mean(SD) | 54.69 (14.57) | 51.23 (14.71) | -2.161 to 9.073 | 1.218* | 0.226 |
| (iii) Social Relationship Domain mean(SD) | 56.02 (20.59) | 49.00 (20.82) | -0.919 to 14.968 | 1.751* | 0.083 |
| (iv) Environment Domain mean(SD) | 63.40 (13.00) | 58.72 (16.70) | -0.807 to 10.166 | 1.689* | 0.094 |

\*indepedent t-test was performed, Level of significant at p < 0.05, CI=Confidence Interval

From the results, there is no association between comorbidity and (i) physical health domain (ii) psychological domain (iii) social relationship domain and (iv) environmental domain of QOL as shown in table 5.4. Elderly who have comorbidity has a higher mean score 54.05 (SD + 13.07) for the physical health domain of QOL compared to those who do not have comorbidity 51.08 (SD + 12.29). For the psychological domain, elderly with comorbidity has a higher mean score 54.69 (SD + 14.57) compared to those without comorbidity 51.23 (SD + 14.71).

For all domains, mean scores are not significantly difference in between those with co-morbid diseases and those without co-morbid diseases as all p-values are greater than 0.05.

# IV. Discussion

This study shows that there is no statistically significant association between gender of and the chances of getting comorbidity among the elderly (Table.3). Both female and male are shown to have a similar prevalence of getting comorbidity. However, most of the study showed an adverse result compared to this study. A study in Bangladesh stated that higher prevalence of multiple morbidity was found among female in the studied population. (MasumaAkter Khanam etal., 2011). Another study in South Korea also showed that the mean number of morbidities were significantly higher among women than men. (Eun-kyung Woo et al., 2007). This finding may be related to the imbalance distribution gender in this study in which the female number is approximately 2 times higher than male.

According to table 4, there is no statistical significance between individual educational level and comorbidity. In 2007, a study in Korea stated that the subject who had no education had a higher chance to have decreased risk of morbidity compared to those who had higher education (Eun-kyung Woo et al., 2007). By comparing to this study, although the result is statistically not significant, it was consistent that people who have lower educational level are at lower risk of getting comorbidity. Besides, another study in India also suggested the same result in which highly educated people has a higher tendency to have multiple morbidity. (PerianayagamArokiasamy et al., 2015)

Based on the result, there is significant difference in average BMI in between those having co-morbid diseases and not having co-morbid disease (Table.5), showing that overweight and obese elderly are more likely to get comorbidity. A study in Europe has shown a similar finding. Obese man and women were associated with poorer subjective health when compared to normal-weight individuals (Peytremann-Bridevaux et al., 2008). Besides, the finding in this study supported another study in 2014 which showed that among the subjects of the same gender and age class the prevalence of comorbidity was always higher in obese than those who are in normal weight. (Rocco Micciolo et al., 2013; Martin Fortin et al., 2014)

According to table 6, there is no association between comorbidity and physical health aspect of quality of life among the elderly as the data obtained is not statistically significant.According to the research conducted by Y. Yamada et al. , higher comorbidity affects the quality of life as the higher the number of diseases, the lower the quality of life. Besides, paper by HakanTüzün et al. stated that the physical health domain decreases significantly when the elderly has three or more chronic diseases. It was demonstrated that different combinations of diseases do affect the quality of life in various ways. A research by Noe Garin et al. also showed similar results. Above studies showed that comorbidity has the greatest effect in physical domain as compared to the other three domains.Furthermore, the research conducted by HakanTüzün et al and Noe Garin et al. has a large sample size of more than one thousand participants whereby the inclusion criteria is similar to this research. This suggested that the number of participants should be increased in order to obtain a more accurate result.

The table 6 shows that comorbidity and psychological aspect of quality of life has no association. It indicates that elderly who have a better score in this domain suffered from more chronic diseases.The same study by HakanTüzün et al showed that mental disorders affect psychological domain the most as it decreases the quality of life significantly. It is also stated that the psychological domain is greatly affected when there is a combination of two or more chronic diseases among the elderly. Besides, Noe Garin et al. also found out that mental disorders such as depression and anxiety has the highest impact to this domain.

No association is seen between comorbidity and social relationship domain (Table. 6). This finding does not support the paper from HakanTüzün et al which indicates that there is a positive association between comorbidity and social relationship domain. In his paper, it stated that mental disorders have the most effect on this domain as the domain decreases with up to two or more chronic conditions obtained from the elderly.

The data obtained shows that there is no association between comorbidity and the environmental domain (Table.6). The results do not support the research conducted by HakanTüzün. According to their report, respiratory also affects this domain the most. As compared to other domains, increasing numbers of diseases up to two or more decreases the score of this domain.

# V. Conclusion

In a nutshell, the increase in elderly population should be considered a major issue and concerns should be focused on the elderly. Although most of the results in this study were not similar to the previous studied conducted, the focus should always be on the elderly population as the increase in aging population is unavoidable. Early screening and detection are crucial and should be carried out among the elderly population to control and better so to prevent co-morbidity to reduce the mortality rate in elderly population.

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