# ORIGINAL ARTICLE

# Catastrophic Health Expenditure Among Cancer Patients In National Cancer Institute (NCI), Malaysia And Its Influencing Factors

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## ABSTRACT

**Introduction:** This study looks at the patient's perspective to determine the Catastrophic Health Expenditure (CHE) level and the possible factors which can be associated with CHE in cancer patients. **Methods:** This cross sectional study was done in National Cancer Institute, Malaysia with 206 patients sampled using the multilevel sampling method and data collected from interview with patients using a validated questionnaire. The CHE definition used in this study is when the monthly health expenditure exceeds more than 10% of the monthly household income. **Results:** This study showed a CHE level of 26.2%. CHE was higher in Indian ethnicity (P = 0.017), single marital status (P = 0.019), poverty income (P < 0.001), small household size (P = 0.006) and without Guarantee Letter (GL) (P = 0.002) groups. The significant predicting factors were poverty income aOR 5.60 (95% CI: 2.34 – 13.39), home distance near to hospital aOR 4.12 (95% CI: 1.74 – 9.76), small household size aOR 4.59 (95% CI: 1.07 – 19.72) and lack of Guarantee Letter aOR 3.21 (95% CI: 1.24 – 8.30). **Conclusion:** The information from this paper can be used by policy makers to formulate better strategies in terms of health financing so that high risk for CHE cancer patients groups can be protected under a better health financing system.

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### **INTRODUCTION**

Catastrophic Health Expenditure (CHE) can be defined as any health expenditure which can threaten the financial capability of a household to maintain its subsistence needs (1). CHE can occur when a household has to pay an amount from out-of-pocket (OOP) for healthcare expenditure, which is higher than a certain threshold level from the household income or expenditure (2). A study by Xu et al. (3) in 89 countries suggested that every year more than 100 million people suffered from CHE and poverty due to health expenditures.

The healthcare expenditure can be divided into direct and indirect expenditures. Direct health expenditures include expenses directly related to the cost of seeking care on medicines and health products; outpatient care services, including dental care; inpatient care services, diagnostic imaging services, medical laboratory services and patient emergency transportation services. Indirect health expenses include intangible costs for healthcare, for example non-emergency transportation costs, meals or accommodation during treatment, costs from deducted salary due to absence from work, and loss of income generating capability secondary to illness.

Cancer is one of the main causes of morbidity and mortality worldwide. In 2020, the World Health Organization (4) reported 19.3 million cancer cases and 10 million cancer deaths globally with 48,639 number of new cancer cases in Malaysia. These numbers were expected to increase significantly with the increase in ageing population, unhealthy lifestyles and increasing exposure to carcinogens due to modernization processes. There are various threshold levels and definitions used to define CHE. The World Health Organization (5) proposed that CHE occurs whenever health expenditure is 40% of a household's non-subsistence income or more. Another threshold, which is commonly used is 10% from the total household income (6). Onoka et al. (7) also has indicated threshold levels of CHE from 5% to 40%. These threshold levels represent the level, whereby the standard quality of life for a household is believed to be threatened due to OOP payments for health.

CHE can occur in developed, middle income and lower income countries. However, 90% of individuals who are involved live in low income countries, which do not have pre-payment health financing mechanisms and they have to pay for healthcare almost entirely using OOP (3). CHE was less than 0.5% in many developed countries (8), whereas developing and poor countries have higher risk of developing CHE due to higher level of poverty which are worsened by the absence of proper and adequate health financing system.

Malaysia is a multiracial, higher middle income country in South East Asia with a total population of 32.73 million, GDP of 4.3% and OOP percentage of between 29% to 37% (9). In Malaysia, public and private sectors provide health services in the ratio of 55% and 45%, respectively. The main source of health financing in the public sector is using global taxation, while in the private sector, the main source is using OOP (10).

The four main health financing mechanisms used globally are taxation, social health insurance, private insurance and OOP (11). Pre-payment methods such as social health insurance and private insurance are effective because the financial risks are shared among all the subscribers or community and this can protect patients from CHE and poverty (12). OOP which is the only mechanism that uses post payment method, is the least efficient and least equitable health financing mechanism. Several countries rely on the mixture of these financing mechanisms rather than just using only one mechanism (13). OOP can comprise 10% to 80% of the total health expenditure of a country (14). Too much dependence on OOP, with low capacity of a household to pay for health services and inadequate pre-payment financing mechanisms are requirements, which can increase CHE prevalence (15).

In our literature search, not many studies are available on the association between cancer and CHE, and there were even less studies done in Malaysia to look at this association (16-19). However, there were also a few studies which have looked into CHE in non-cancer patients in Malaysia such as by Loganathan et al. (20), Sukeri et al. (21), Zainal et al. (22), Sayuti and Sukeri (23), and Samsudin et al. (24). A large scale study on cancers involving Malaysia was conducted by the ACTION group, as part of the CHE prevalence study among cancer cases in South East Asia (25). Therefore, our study was conducted to fill these gaps with the hope that the information on CHE can be used currently in healthcare budgetary allocations for cancer, or when deciding which diseases or risk factors to focus on when formulating the national social health insurance in the future.

# MATERIALS AND METHODS

This study was conducted in the National Cancer Institute (NCI) which is the main national referral centre for cancer cases in Malaysia. NCI is a public hospital located in the Klang Valley, which is in the central region of West Malaysia, whereby almost 30% of cancer cases in Malaysia were being treated (26). The radiotherapy and oncology department in NCI provides radical and palliative treatments to cancer patients from Klang Valley as well as from other regions in the country.

This cross-sectional study was conducted from October 2018 until February 2019. The sampling in this quantitative research was done using multilevel sampling methods, whereby the hospital was chosen using purposive sampling because NCI is the only public cancer centre at the national level. This was followed by purposive sampling of the oncology department as it holds the biggest number of cancer patients, and subsequently systematic random sampling of patients based on the patients' list at the department.

The ward admission lists and clinic/day-care/ radiotherapy clinic attendance lists were used as a basis to recruit the inpatient and outpatient samples in the department. The initial number of samples calculated using the PS software to calculate sample size for two proportions was 212, however only 206 was included in this study due to 2.8% non response rate of the samples. Informed consent was obtained from all respondents and the information was made confidential. This study was approved by the Medical Research and Ethics Committee, Ministry of Health No. NMRR-18-2680-43436 (IIR) and the Research Ethics Committee, Universiti Kebangsaan Malaysia No. UKM FPR.4/244/ FF-2018-452. We also obtained approval from the Director of the National Cancer Institute to conduct this research.

The study tools used were validated questionnaires and interviews with patients, document review on patient's case notes and associated interviews with family members, who took care of the patients as well as the inpatient/outpatient staff in-charge of the patients. The respondents were asked about their personal data as well as some questions regarding their household income, expenditure, diseases and treatment data. The questionnaire was validated using content validity, whereby information from literature reviews and input from three experts in the health economics field were obtained; and face validity, whereby a pilot interview with seven selected respondents (different from the study samples) were done to ensure they understand each and every words and sentences in the questionnaire. All incomes and expenditures were stated in Malaysian Ringgit currency (RM 1 = USD 0.23).

The dependant variable for this study is CHE, which can be defined as any health expenditure that can threaten a household's financial capacity to maintain its subsistence needs. CHE is determined from OOP health spending i.e. payment made during seeking treatment and it excludes prepayment and reimbursement of the household by a third party or a private insurance company. Only direct health expenditure which includes direct and tangible healthcare costs, for example, the doctor's consultation fees, hospital bills, cost of medications, radiotherapy, diagnostic tests and other direct health services expenses were included to determine CHE.

CHE was defined as occurring when the monthly health expenditure exceeds 10% of the total monthly household income. Poverty income was defined as household with income of less than RM2208 (USD530.32) per month. Home distance from the hospital was categorized into within Klang Valley (near) and outside Klang Valley (far). The household size was categorized into one to two members (small), three to five members (medium) and six or more members (large). Household expenditures include the rent, food, utility, transport, education, clothing, health care and loan payments costs for the household.

The types of cancer were categorized according to their primary location in the body. The cancer duration was divided into less than one year (short), one to two years (moderate) and more than two years (long). The cancer stage was categorized into Stage I to Stage IV based on the existing cancer staging criteria. The types of treatment were categorized into symptomatic/ follow-up treatment, chemotherapy, radiotherapy and a combination of chemo-radiotherapy. The frequency of treatment per year was divided into 1–3 sessions (infrequent), 4–11 sessions (frequent) and 12 sessions or more (very frequent). Apart from health insurance, the use of a Guarantee Letter (GL) and presence of health financial aides were also included as possible independent variables, which could influence CHE.

A one-year reference period was used in compiling the disease and treatment history. A shorter reference period (three months) was used for income/expenditure history, as longer recall periods might predispose respondents to recall bias for financial data. Other steps to minimize the recall bias include verifying the information/data with the patient's appointment book, available receipts and re-check with other family members, if necessary. Data analysis was performed with Statistical Package for Social Sciences (SPSS 22.0) version 22.0. The descriptive analysis was done using frequency distribution, central tendency and variability of a data set, while the bivariate analysis was done using the two-sided Chi-Square test, followed by multivariate analysis using binomial logistic regression. The fit of the logistic regression model was tested using Omnibus, Hosmer and Lemeshow, correctly classified percentage in the classification table and Nagelkerke R-Squared tests. Area under the Receiver Operating Characteristics (ROC) curve tests and twoways interaction between the independent variables using multicollinearity tests were done to ensure the validity of the results.

### RESULTS

The percentage of respondents with CHE was 26.2%.

The mean age was 52.9 years old and the mean household size was four. Table I shows the minimum, maximum, median, and the interquartile values for the income and expenditure data. The monthly income values ranged from RM450 to RM27000, the monthly expenditure values ranged from RM260 to RM11580 and the monthly health expenditure values ranged from RM0 to RM2200. The median monthly income, monthly expenditure and monthly health expenditure values were RM4000 (IQR = 2000), RM2637 (IQR = 2496) and RM200 (IQR = 262) respectively.

Table I: Income and expenditure d	lata
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	Min	Max	Median	Interquartile Range		
				25th	50th	75th
Monthly income (RM)	450	27000	4000	2000	4000	6000
Monthly expenditure (RM)	260	11580	2637	1504	2637	4000
Monthly health expenditure (RM)	0	2200	200	100	200	362

\* RM 1 = USD 0.23

The descriptive analysis in Table II shows that the majority of the respondents were Malay ethnicity, married, unemployed, lower income group, not in the poverty income, from urban areas, had male as head of household, not a single mother, had medium household size, did not have less than 6 years old household member, cancer duration less than one year, outpatient category, did not have prior treatment in private healthcare facility, without disability, without GL and without financial health aides. The bivariate analysis in Table II shows that CHE was significantly higher in the groups with Indian ethnicity, single marital status, poverty income, small household size and without GL.

The Logistic Regression analysis in Table III shows the the significant predicting factors were poverty income aOR 5.60 (95% CI: 2.34 - 13.39), home distance near to hospital aOR 4.12 (95% CI: 1.74-9.76), small household size aOR 4.59 (95% CI: 1.07 - 19.72) and lack of Guarantee Letter aOR 3.21 (95% CI: 1.24 - 8.30). This means that the odds of CHE happening in the poverty income group are about five and a half times the odds of CHE happening in the non-poverty income group. Additionally, the odds of CHE in the within Klang Valley (home distance near to hospital) group is four times the odds of it happening in the outside Klang Valley (home far from hospital) group. The odds of CHE in the small household size group is about four and a half times the odds of it happening in the large household size group, and the odds of CHE in the without Guarantee Letter (GL) group is about three times the odds of it happening in the with GL group. The final model for logistic regression had a good fit with an Omnibus test value of P < 0.001, a Hosmer and Lemeshow test value of P > 0.05, the classification table was 81.1% correctly classified and the Nagelkerke R2 value was 0.345. There was no multicollinearity between the variables and the

# Table II: Descriptive and bivariate analysis of the study population (n = 206)

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# Table II: Descriptive and bivariate analysis of the study population (n = 206) (Continued)

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Others1 curve4 thereMarital status0.019 × 0Single19 (9.2)10 (52.6)9 (47.4)Married160 (77.7)39 (24.4)121 (75.6)Divorced/widowed27 (13.1)5 (18.5)22 (81.5)Education level5 (18.2)7 (87.5)7 (87.5)None8 (3.9)11 (2.5)7 (87.5)Primary school39 (43.2)26 (29.2)63 (70.8)Quiversity/ college66 (32.0)15 (22.7)31 (72.1)Employent status10 (51.5)26 (82.6)27 (87.9)Self-employed31 (63.0)11 (19.6)45 (80.4)Retired/ pensioner31 (15.0)17 (7)12 (92.3)Yes66 (32.0)31 (47.0)35 (33.0)No10 (65.1)81 (30.1)15 (35.0)10 (73.1)Yes66 (32.0)31 (47.0)35 (35.0)10 (73.1)Outside Klang Valley (near)66 (32.0)31 (47.0)35 (35.0)Outside Klang Valley (near)15 (35.7)12 (22.6)41 (77.4)Yes153 (73.1)21 (22.6)41 (77.4)Homa15 (35.7)12 (22.6)41 (77.4)Quiside Klang Valley (near)15 (35.7)12 (22.6)41 (77.4)Yes153 (74.3)22 (27.5)111 (72.5)Heade150 (72.1)12 (22.6)41 (77.4)Yes153 (74.3)22 (27.5)111 (72.5)Retard153 (72.1)12 (22.6)41 (77.4)Yes153 (74.3)22 (27.5)111 (72.5) </td <td>Chinese</td> <td>46 (22.3)</td> <td>17 (37.0)</td> <td>29 (63.0)</td> <td></td>	Chinese	46 (22.3)	17 (37.0)	29 (63.0)	
Arrial status0.013-00.102.00.47.00.47.0Single10.07.030.24.00.47.00.47.00.47.0Married27.01.050.80.027.02.050.80.00.47.0Fuctoriever8.03.01.02.00.47.0.00.47.0.00.47.0.0Single school8.04.0.02.02.000.47.0.00.47.0.0Chroinsylcolleg6.03.0.01.02.0.00.47.0.00.47.0.0Chroinsylcolleg6.03.0.01.02.0.00.47.0.00.47.0.0Chroinsylcolleg5.02.0.04.02.0.00.47.0.00.47.0.0Chroinsylcolleg3.01.0.01.01.003.02.0.00.47.0.0Chroinspiole1.01.0.01.01.001.01.000.47.0.0Chroinspiole1.01.0.01.01.001.01.000.47.0.0Chroinspiole1.01.0.01.01.001.01.000.47.0.0Chroinspiole1.01.0.01.01.001.01.000.47.0.0Chroinspiole1.01.0.01.01.0.01.01.0.01.01.0.0Chroinspiole1.01.0.01.01.0.01.01.0.01.01.0.0Chroinspiole1.01.0.01.01.0.01.01.0.01.01.0.0Chroinspiole1.01.0.01.01.0.01.01.0.01.01.0.0Chroinspiole1.01.0.01.01.0.01.01.0.01.01.0.0Chroinspiole1.01.0.01.01.0.01.01.0.01.01.0.0Chroinspiole1.01.0.01.01.0.01.01.0.01.01.0.0Chroinspiole1.01.0.01.01.0.0 <td>Indian</td> <td>35 (17.0)</td> <td>14 (40.0)</td> <td>21 (60.0)</td> <td></td>	Indian	35 (17.0)	14 (40.0)	21 (60.0)	
Single19 0.9.0.10 2.0.9.47.4.Married1607.7.9.104.4.121.7.5.0.Divorced/widowed27 (13.1)5.108.5.2.2 (31.5.)Eduction level8.0 3.0.11.2.5.7.0 (7.5.).Nome8.0 3.0.12.0.2.0.3.0 (7.1.).Primary school8.0 (3.0.)5.0 (2.0.).6.0 (7.0.).Condary school6.0 (3.0.)5.0 (2.0.).5.0 (7.0.).Diviersity/college6.0 (3.0.)7.0 (7.0.).Paployed5.0 (2.0.).7.0 (7.0.).Self-employed13.0 (6.0.).11.0 (7.0.).Cherred pensioner3.1 (15.0.)1.0 (7.0.).Otemployed10.6 (5.1.).8.0 (3.0.).Poretry income6.0 (3.0.).3.0 (3.0.).No10.0 (6.0.).3.0 (3.0.).1.0 (7.0.).No10.0 (7.0.).1.0 (7.0.).1.0 (7.0.).Othink Rlang Valley (nar)16.0 (3.0.).1.0 (7.0.).Othink Rlang Valley (nar)16.0 (3.0.).1.0 (7.0.).Othink Rlang Valley (nar)15.0 (7.0.).1.0 (7.0.).Othink Rlang Valley (nar)15.0 (7.0.)	Others	5 (2.4)	1 (20.0)	4 (80.0)	
Maried       160 (7.7)       39 (24.4)       121 (7.5.6)         Divorced/ widowed       27 (13.1)       5 (18.5)       22 (81.5)         Education level       8 (3.9)       1 (12.5)       7 (87.5)         Primary school       83 (30.9)       1 (12.5)       7 (87.5)         Secondary school       80 (43.2)       26 (20.2)       31 (72.1)         Secondary school       60 (30.0)       15 (20.2)       51 (7.3.)         Impleyed       66 (32.0)       17 (19.0)       45 (80.4)         Paployed       13 (6.3)       11 (19.0)       45 (80.4)         Reitred/ pensioner       13 (15.0)       17 (7.7)       12 (92.3)         Chemengoyed       13 (6.3)       11 (7.6)       12 (92.3)         Chemengoyed       13 (6.3)       11 (7.6)       35 (53.0)         No       140 (68.0)       13 (17.0)       12 (92.3)         Outside Klang Valley (near)       36 (31.0)       80 (69.0)       11 (76.5)         Quida Klang Valley (near)       13 (27.7)       12 (92.6)       11 (72.5)         Chura       13 (7.4)       13 (7.4)       14 (77.4)         Quida Klang Valley (near)       36 (31.0)       80 (69.0)       13 (7.4)         Quida Klang Valley (near)       13	Marital status				0.019 *
Invorced/windowed27 (13.)5 (18.)2 (281.5)Fiducation level8 (3.9)1 (12.5)7 (87.5)Nome8 (3.0)1 (2 (27.9)3 (1 (2.1)Secondary school6 (3 (3.0)1 (2 (2.2)6 (3 (7.0)Chiversity/college6 (3 (2.0)1 (2 (2.2)1 (2 (2.2)Singporent status1 (1 (3.0)1 (2 (2.3)1 (2 (2.3)Cherney polycel13 (6.3)1 (1 (7.0)1 (2 (2.3)Cherney polycel13 (6.3)1 (1 (7.0)1 (2 (2.3)Cherney polycel1 (1 (3.0)1 (1 (7.0)1 (2 (2.3)Cherney polycel1 (3 (6.3)1 (1 (7.0)1 (2 (2.3)Cherney polycel1 (3 (6.3)1 (1 (7.0)1 (2 (2.3)Cherney polycel1 (3 (6.3)1 (1 (7.0)1 (2 (2.3)No1 (3 (6.3)1 (3 (6.3)1 (3 (6.3)1 (7.1)No1 (3 (3.0)1 (3 (3.0)1 (3 (3.0)1 (3 (3.0)Cherney polycel1 (3 (2.3)1 (1 (2.3)1 (1 (2.3)Cherney polycel1 (3 (2.3)1 (1 (2.3)1 (1 (2.3)Cherney polycel1 (3 (2.3)1 (2 (2.3)1 (1 (2.3)Cherney polycel1 (3 (2.3)1 (2 (2.3)1 (1 (2.3)Cherney polycel1 (3 (2.3)1 (2 (2.3)1 (2 (2.3)Cherney polycel1 (3 (2.3)1 (2 (2.3)	Single	19 (9.2)	10 (52.6)	9 (47.4)	
Algebra8 (3.9)1 (12.5)7 (37.5)None8 (3.9)1 (12.5)3 (17.1)Pinny school43 (30.0)12 (27.9)31 (72.1)Secondary school80 (43.2)26 (29.2)63 (70.8)University/ college66 (30.0)13 (72.1)72 (67.9)Employed76 (67.2)34 (32.1)72 (67.9)Self-employed13 (63.0)11 (19.0)45 (80.4)Cherred/pensioner31 (15.0)1 (7.7)12 (92.3)Outenployed106 (51.5)8 (25.8)23 (74.2)Poerty income20 (16.4)31 (17.0)35 (53.0)Yes66 (32.0)31 (47.0)35 (53.0)No140 (68.0)21 (16.3)0.043.7)Poerty income20 (16.4)110 (80.7)Yes66 (32.0)11 (75.6)Yes53 (73.0)12 (25.0)Outside Klang Valley (nar)36 (31.0)80 (90.0)Outside Klang Valley (nar)36 (32.7)12 (26.0)Yes53 (27.7)12 (27.0)11 (72.5)Yenane53 (27.7)12 (27.6)11 (72.5)Male180 (87.4)4 (25.6)134 (74.4)Yes18 (68.7)13 (47.6)14 (74.4)Yes11 (10.2)5 (23.8)16 (76.2)Yes12 (10.2)5 (23.8)16 (76.2)Yes13 (16.3)4 (25.6)13 (73.6)Yes13 (16.3)14 (26.3)13 (75.6)Yes13 (16.3)14 (26.3)13 (75.6)Yes13 (16.3)14	Married	160 (77.7)	39 (24.4)	121 (75.6)	
None8 (3.9)1 (1.2.5)7 (7.5.5)Primary school43 (20.0)12 (27.9)31 (72.1)Secondary school89 (43.2)26 (22.2)63 (70.8)University/college65 (27.2)34 (32.1)72 (67.9)Employent stats11 (19.0)45 (80.4)10 (9.7)12 (92.3)Self-employed13 (6.3)11 (19.0)45 (80.4)10 (9.7)Querny income10 (6 (51.5)8 (25.8)23 (74.2)6.001***********************************	Divorced/ widowed	27 (13.1)	5 (18.5)	22 (81.5)	
Primary school43 (20.9)12 (27.9)31 (72.1)Secondary school89 (43.2)26 (29.2)63 (70.8)University/ college66 (32.0)15 (22.7)51 (77.3)Employment status56 (27.2)34 (32.1)72 (67.9)Self-employed13 (6.3)11 (19.6)45 (80.4)Retired/ pensioner31 (15.0)17.7)12 (92.3)Unemployed106 (51.5)8 (25.8)23 (74.2)Poverty income $< 6.032.00$ 31 (47.00)35 (53.00)No140 (68.00)23 (16.4)117 (83.6)Pouts distance from hospital $< 0.074$ 0.043.7)Within Klang Valley (near)36 (31.0)80 (69.0)116 (56.3)Outside Klang Valley (near)36 (31.0)80 (69.0)116 (56.3)Quark53 (25.7)12 (22.6)41 (77.4)Urban153 (74.3)42 (27.5)111 (72.5)Hene area $0.932$ 111 (72.5)Kural53 (25.7)12 (22.6)41 (77.4)Urban153 (74.3)42 (27.5)111 (72.5)Male180 (87.4)46 (25.6)134 (74.4)Female26 (12.6)8 (30.8)18 (69.2)Yes21 (10.2)5 (23.8)16 (75.2)No185 (89.8)49 (26.5)136 (73.5)Poserbold size $0.072$ 90 (43.7)1-237 (18.0)16 (43.2)21 (56.8)Single mother $0.072$ 97 (74.0)1-237 (18.0)16 (43.2)21 (55.0)3-5131	Education level				0.644
Network89 (43.2)26 (29.2)63 (70.8)University/college66 (32.0)15 (27.2)51 (77.3)Employment status56 (27.2)34 (32.1)72 (67.9)Self-employed13 (6.3)11 (19.6)45 (80.4)Retired/ pensioner31 (15.0)11 (7.7)12 (92.3)Unemployed106 (51.5)8 (25.8)23 (74.2)Poerty income23 (16.4)117 (83.6)No140 (68.0)23 (16.4)117 (83.6)Pomet distance from hospital36 (31.0)80 (69.0)116 (56.3)Outside Klang Valley (nar)36 (31.0)80 (69.0)116 (56.3)Quiside Klang Valley (nar)153 (74.3)42 (27.5)111 (72.5)Rural53 (25.7)12 (22.6)411 (77.4)Guban153 (74.3)42 (27.5)111 (72.5)Male180 (87.4)46 (25.6)134 (74.4)Females26 (12.6)8 (30.8)18 (69.2)Agend180 (87.4)46 (25.6)134 (74.4)Female26 (12.6)8 (30.8)18 (69.2)Yes21 (10.2)5 (23.8)16 (75.2)No185 (89.8)49 (26.5)136 (75.2)Yes21 (10.2)5 (23.8)16 (75.2)Yes37 (18.0)16 (43.2)21 (56.8)Hanel37 (18.0)16 (43.2)21 (56.8)Yes37 (18.0)16 (43.2)31 (83.6)Yes37 (18.0)16 (43.2)31 (85.6)Yes37 (18.0)16 (43.2)31 (85.6)Ye	None	8 (3.9)	1 (12.5)	7 (87.5)	
Iniversity college66 (32.0)15 (22.7)51 (77.3)Employed56 (27.2)34 (32.1)72 (67.9)Self-employed13 (6.3)11 (19.6)45 (80.4)Retired/pensioner31 (15.0)12 (92.3)23 (74.2)Unemployed106 (51.5)8 (25.8)23 (74.2)Poverty income66 (32.0)31 (47.0)35 (53.0)No140 (68.0)23 (16.4)117 (83.6)No140 (68.0)23 (16.4)117 (83.6)Outside Klang Valley (near)36 (31.0)72 (80.0)Outside Klang Valley (near)36 (31.0)72 (22.6)Aftma Para53 (25.7)12 (22.6)Rural53 (25.7)12 (22.6)Auge13 (37.6)42 (27.5)Pichand53 (27.7)12 (27.6)Male13 (63.7)42 (27.5)Male13 (63.7)13 (47.4)Fenale26 (12.6)314 (74.4)Fenale26 (12.6)134 (74.4)Fenale21 (10.2)52 (3.8)Alge13 (63.6)14 (62.5)Alge13 (63.6)13 (63.6)Alge13 (63.6)13 (63.6)Alge13 (13.6)14 (26.3)Alge13 (13.6)14 (13.6)Alge13 (13.6)34 (85.7)Alge13 (13.6)34 (85.7)Alge13 (13.6)34 (85.7)Alge13 (13.6)34 (85.7)Alge13 (13.6)34 (85.7)Alge13 (13.6)34 (85.7)Alge13 (13.6)<	Primary school	43 (20.9)	12 (27.9)	31 (72.1)	
Employent status       0.142         Employed       56 (27.2)       34 (32.1)       72 (67.9)         Self-employed       13 (6.3)       11 (19.6)       45 (80.4)         Retired/pensioner       31 (15.0)       17 (7.7)       12 (92.3)         Unemployed       106 (51.5)       8 (25.8)       23 (74.2)         Poverty income             Yes       66 (32.0)       31 (47.0)       35 (53.0)           No       140 (68.0)       23 (16.4)       117 (83.6)            Yes       66 (32.0)       30 (69.0)       116 (56.3)             No       140 (68.0)       23 (16.4)       117 (83.6)             Yes       65 (32.0)       12 (22.6)       91 (37.7)             Guada       133 (25.7)       12 (22.6)       131 (74.0)	Secondary school	89 (43.2)	26 (29.2)	63 (70.8)	
Import Self-employed $56 (27.2)$ $34 (32.1)$ $72 (67.9)$ Self-employed $13 (6.3)$ $11 (19.6)$ $45 (80.4)$ Retired/pensioner $31 (15.0)$ $17 (7.7)$ $12 (92.3)$ Unemployed $106 (51.5)$ $8 (25.8)$ $23 (74.2)$ Poverty income $< 0001^{10}$ $35 (53.0)$ $< 0.001^{10}$ No $140 (68.0)$ $23 (16.4)$ $117 (83.6)$ $0.074$ Mode distance from hospital $23 (16.4)$ $117 (83.6)$ $0.074$ Within Klang Valley (nar) $36 (31.0)$ $80 (69.0)$ $116 (56.3)$ Quaside Klang Valley (nar) $36 (31.0)$ $80 (69.0)$ $0143.7)$ Rural $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Urban $153 (74.3)$ $42 (27.5)$ $111 (72.5)$ Head of household gender $0.572$ $0.572$ Male $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ No $185 (89.8)$ $92 (65.5)$ $136 (73.5)$ Pres $21 (10.2)$ $5 (23.8)$ $16 (75.2)$ No $131 (63.6)$ $34 (85.7)$ $16 (45.2)$ $12$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $12$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $12$ $31 (16.3)$ $34 (85.7)$ $40 (19.4)$ $45$ (spars old in household $40 (19.4)$ $6 (15.0)$ $34 (85.7)$ $12$ $37 (18.0)$ $16 (75.0)$ $34 (85.7)$ $12$ $37 (18.0)$ $18 (28.9)$ $18 (71.7)$ </td <td>University/ college</td> <td>66 (32.0)</td> <td>15 (22.7)</td> <td>51 (77.3)</td> <td></td>	University/ college	66 (32.0)	15 (22.7)	51 (77.3)	
Self-employed13 (6.3)11 (19.6)45 (80.4)Retired/pensioner31 (15.0)1 (7.7)12 (92.3)Unemployed106 (51.5)8 (25.8)23 (74.2)Poverty income $< 0.001 *$ Yes66 (32.00)31 (47.0)35 (53.0)No140 (68.0)23 (16.4)117 (83.6)Muthin Klang Valley (near)36 (31.0)80 (69.0)116 (56.3)Outside Klang Valley (far)18 (20.0)72 (80.0)90 (43.7)Home area23 (74.3)42 (27.5)111 (72.5)Rural53 (25.7)12 (22.6)41 (77.4)Urban153 (74.3)42 (27.5)111 (72.5)Male180 (87.4)46 (25.6)134 (74.4)Female26 (12.6)8 (30.8)18 (69.2)Again185 (88.8)49 (26.5)136 (73.5)Yes21 (10.2)5 (23.8)16 (76.2)Household size $131$ (63.6)34 (26.0)Household size $131$ (63.6)34 (26.0)1-237 (18.0)16 (43.2)21 (56.8)1-237 (18.0)16 (43.2)21 (56.8)1-237 (18.0)34 (26.0)97 (74.0)2-638 (18.4)4 (10.5)34 (85.0)2-7Yes40 (19.4)6 (15.0)34 (85.0)1-240 (19.4)6 (15.0)34 (85.0)2-8100106 (63.6)48 (28.9)118 (71.1)2-9101106 (26.1)34 (85.0)10.712-9101106 (26.1)34 (85	Employment status				0.142
Retired/pensioner $31 (15.0)$ $1 (7.7)$ $12 (92.3)$ Unemployed $106 (51.5)$ $8 (25.8)$ $23 (74.2)$ Poverty income $< 0.001^{\circ}$ Yes $66 (32.0)$ $31 (47.0)$ $35 (53.0)$ No $140 (68.0)$ $23 (16.4)$ $117 (83.6)$ No $140 (68.0)$ $23 (16.4)$ $117 (83.6)$ Home distance from hospital $0.074$ $0.074$ Outside Klang Valley (near) $36 (31.0)$ $80 (69.0)$ $116 (56.3)$ Outside Klang Valley (far) $18 (20.0)$ $72 (80.0)$ $90 (43.7)$ Home area $13 (74.3)$ $21 (22.6)$ $41 (77.4)$ Cuban $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Urban $153 (74.3)$ $42 (27.5)$ $111 (72.5)$ Head of household gender $0.572$ $0.572$ Nale $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Oppertunities $0.572$ $0.572$ No $158 (89.8)$ $49 (26.5)$ $136 (75.2)$ Household size $0.721$ $0.792$ I -2 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ I -2 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ I -2 $31 (16.3)$ $34 (26.0)$ $97 (74.0)$ I -2 $32 (10.2)$ $5 (23.8)$ $16 (75.0)$ I -2 $31 (16.3)$ $34 (26.0)$ $97 (74.0)$ I -2 $32 (10.2)$ $31 (63.6)$ $34 (85.0)$ I -2 $32 (10.2)$ $31 (63.6)$ $34 (85.0)$ </td <td>Employed</td> <td>56 (27.2)</td> <td>34 (32.1)</td> <td>72 (67.9)</td> <td></td>	Employed	56 (27.2)	34 (32.1)	72 (67.9)	
Unemployed106 (51.5)8 (25.8)23 (74.2)Poverty income66 (32.0)31 (47.0)35 (53.0)Yes66 (32.0)31 (47.0)35 (53.0)No140 (68.0)23 (16.4)117 (83.0)40 (74.0)Home distance from hospital53 (31.0)80 (69.0)116 (56.3)40 (74.0)Outside Klang Valley (near)36 (31.0)80 (69.0)90 (43.7)40 (43.0)Gutside Klang Valley (far)18 (20.0)72 (80.0)90 (43.7)40 (43.0)Home area53 (25.7)12 (22.6)41 (77.4)40 (43.0)Gutand53 (25.7)12 (22.6)41 (77.4)50 (77.4)Urban153 (74.3)42 (27.5)111 (72.5)50 (77.4)Male180 (87.4)42 (27.5)111 (72.5)50 (77.4)Female26 (12.6)8 (30.8)136 (69.0)40 (79.4)Yes21 (10.2)5 (23.8)136 (69.2)40 (79.4)Yes21 (10.2)5 (23.8)13 (63.0)40 (79.4)Yes37 (18.0)16 (43.2)21 (56.8)40 (79.4)Yes37 (18.0)16 (43.2)21 (56.8)40 (79.4)Yes38 (18.4)4 (10.5)34 (80.0)40 (79.4)Yes40 (19.4)6 (15.0)34 (80.0)40 (79.4)Yes40 (19.4)6 (15.0)34 (85.0)40 (79.4)Yes40 (19.4)6 (15.0)34 (85.0)40 (79.4)Yes40 (19.4)6 (15.0)34 (85.0)40 (79.4)Yes40 (19.4)	Self-employed	13 (6.3)	11 (19.6)	45 (80.4)	
Poverty income $< 0.001 + 0.001$ Yes $66 (32.0)$ $31 (47.0)$ $35 (53.0)$ No $140 (68.0)$ $23 (16.4)$ $117 (83.6)$ No $140 (68.0)$ $23 (16.4)$ $117 (78.3)$ Home distance from hospital $36 (31.0)$ $80 (69.0)$ $116 (56.3)$ Outside Klang Valley (near) $36 (31.0)$ $80 (69.0)$ $116 (56.3)$ Outside Klang Valley (near) $18 (20.0)$ $72 (80.0)$ $90 (43.7)$ Home area $72 (80.0)$ $90 (43.7)$ $0.493$ Rural $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Urban $153 (74.3)$ $42 (27.5)$ $111 (72.5)$ Head of household gender $13 (74.3)$ $42 (27.5)$ $111 (72.5)$ Male $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ $0.792$ Yes $21 (10.2)$ $5 (23.8)$ $16 (75.2)$ $0.072$ Yes $21 (10.2)$ $5 (23.8)$ $16 (75.2)$ $0.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.006 + 10.$	Retired/ pensioner	31 (15.0)	1 (7.7)	12 (92.3)	
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No140 (68.0)23 (16.4)117 (83.6)No140 (68.0)23 (16.4)117 (78.3)Home distance from hospital36 (31.0)80 (69.0)116 (56.3)Outside Klang Valley (nar)18 (20.0)72 (80.0)90 (43.7)Outside Klang Valley (far)18 (20.0)72 (80.0)90 (43.7)Home area53 (25.7)12 (22.6)41 (77.4)Curban153 (74.3)42 (27.5)111 (72.5)Head of household gender	Poverty income				< 0.001 *
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Within Klang Valley (near) $36 (31.0)$ $80 (69.0)$ $116 (56.3)$ $90 (43.7)$ Cutside Klang Valley (far) $18 (20.0)$ $72 (80.0)$ $90 (43.7)$ Home area $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Rural $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Urban $153 (74.3)$ $42 (27.5)$ $111 (72.5)$ Head of household gender $0.572$ $0.572$ Male $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Single mother $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ No $185 (89.8)$ $49 (26.5)$ $136 (73.5)$ Pasehold size $0.072$ $0.006 *$ 1-2 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ 2-3 $31 (63.6)$ $34 (26.0)$ $97 (74.0)$ 2-6 $38 (18.4)$ $41 (10.5)$ $34 (85.0)$ 2-6 spars old in household $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ 2-6 forpars old in household $166 (80.6)$ $48 (28.7)$ $108 (71.4)$	No	140 (68.0)	23 (16.4)	117 (83.6)	
Outside Klang Valley (far)18 (20.0)72 (80.0)90 (43.7)Home area $0.493$ Rural $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Urban $153 (74.3)$ $42 (27.5)$ $111 (72.5)$ Head of household gender $0.572$ Male $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Single mother $0.572$ Yes $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ No $185 (89.8)$ $49 (26.5)$ $136 (73.5)$ Household size $0.006 *$ 1-2 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $2 - 5$ $31 (163.6)$ $34 (26.0)$ $97 (74.0)$ $2 - 6$ $38 (18.4)$ $4 (10.5)$ $34 (89.5)$ Yes $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ Yes $108 (52.4)$ $31 (28.7)$ $77 (78.1)$	Home distance from hospital				0.074
Home area0.493Rural $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Urban $153 (74.3)$ $42 (27.5)$ $111 (72.5)$ Head of household gender $12 (37.6)$ $111 (72.5)$ Male $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Single mother $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Yes $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ No $185 (89.8)$ $49 (26.5)$ $136 (73.5)$ Household size $5 (23.8)$ $16 (76.2)$ 1-2 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ 2-5 $31 (163.6)$ $34 (26.0)$ $97 (74.0)$ 2-6 $38 (18.4)$ $41 (10.5)$ $34 (80.5)$ 2-6 (spars old in household $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ Yes $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ $6 (35.4)$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ Yes $108 (52.4)$ $31 (28.7)$ $77 (78.1)$	Within Klang Valley (near)	36 (31.0)	80 (69.0)	116 (56.3)	
Rural $53 (25.7)$ $12 (22.6)$ $41 (77.4)$ Urban $153 (74.3)$ $22 (27.5)$ $111 (72.5)$ Head of household gender $23 (74.3)$ $42 (27.5)$ $111 (72.5)$ Male $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ $26 (12.6)$ $83 (08.6)$ $18 (69.2)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ $0.792$ Single mother $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ $0.792$ Yes $21 (10.2)$ $5 (23.8)$ $16 (75.2)$ $0.006 *$ 1-2 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $0.006 *$ 2-4 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $0.072 *$ 2-5 $38 (18.4)$ $41 (0.5)$ $34 (85.7)$ $0.072 *$ Yes $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ $0.072 *$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ $0.394 *$ Yes $10 (16.9) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * (16.8) * $	Outside Klang Valley (far)	18 (20.0)	72 (80.0)	90 (43.7)	
Urban $133 (74.3)$ $42 (27.5)$ $111 (72.5)$ Head of household gender $0.572$ Male $180 (87.4)$ $46 (25.6)$ $134 (74.4)$ Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Single mother $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Yes $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ No $215 (10.2)$ $5 (23.8)$ $16 (76.2)$ 12 $21 (10.2)$ $49 (26.5)$ $136 (73.5)$ 12 $37 (18.0)$ $49 (26.5)$ $21 (56.8)$ 12 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ 24 $31 (16.3)$ $34 (89.5)$ $34 (89.5)$ 25 $40 (19.4)$ $4 (10.5)$ $34 (89.5)$ Yes $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ 26 Opears old in household $16 (80.6)$ $41 (28.5)$ $118 (71.1)$ Yes $108 (52.4)$ $31 (82.7)$ $77 (78.1)$	Home area				0.493
Ornan $133 (74.3)$ $42 (27.3)$ Head of household gender0.572Male180 (87.4)46 (25.6)134 (74.4)Female26 (12.6)8 (30.8)18 (69.2)Single mother0.792Yes21 (10.2)5 (23.8)16 (76.2)No185 (89.8)49 (26.5)136 (73.5)Household size0.006*1-237 (18.0)16 (43.2)21 (56.8)3-5131 (63.6)34 (26.0)97 (74.0) $\geq 6$ years old in household0.0720.072Yes40 (19.4)6 (15.0)34 (85.0)No166 (80.6)48 (28.9)118 (71.1) $\geq 60$ years old in household0.0394	Rural	53 (25.7)	12 (22.6)	41 (77.4)	
Head of household gender $0.572$ Male180 (87.4) $46$ (25.6) $134$ (74.4)Female26 (12.6) $8$ (30.8) $18$ (69.2)Single mother26 (12.6) $5$ (33.8) $16$ (76.2)Yes21 (10.2) $5$ (23.8) $16$ (76.2)No185 (89.8) $49$ (26.5) $136$ (73.5)Household size $0.006^{+1}$ $0.006^{+1}$ 1-2 $37$ (18.0) $16$ (43.2) $21$ (56.8)2-6 $38$ (18.4) $41$ (10.5) $34$ (89.5) $\leq$ 6 years old in household $40$ (19.4) $6$ (15.0) $34$ (85.0)Yes $40$ (19.4) $6$ (15.0) $34$ (85.0)No $166$ (80.6) $48$ (28.9) $118$ (71.1) $\geq$ 60 years old in household $108$ (52.4) $31$ (128.7) $77$ (78.1)	Urban	153 (74 3)	42 (27 5)	111 (72.5)	
Male180 (87.4)46 (25.6)134 (74.4)Female26 (12.6)8 (30.8)18 (69.2)Single mother $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Yes21 (10.2) $5 (23.8)$ $16 (76.2)$ No185 (89.8) $49 (26.5)$ $136 (73.5)$ Household size $21 (16.8)$ $21 (56.8)$ 1-2 $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ 3-5131 (63.6) $34 (26.0)$ $97 (74.0)$ $\geq 6$ years old in household $40 (19.4)$ $41 (10.5)$ $34 (89.5)$ No166 (80.6) $48 (28.9)$ $118 (71.1)$ $\geq 60$ years old in household $108 (52.4)$ $31 (28.7)$ $77 (78.1)$		155 (7 115)	12 (2) 13)		
Female $26 (12.6)$ $8 (30.8)$ $18 (69.2)$ Single mother $0.792$ Yes $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ No $185 (89.8)$ $49 (26.5)$ $136 (73.5)$ Household size $0.006^{*}$ $1-2$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $3-5$ $131 (63.6)$ $34 (26.0)$ $97 (74.0)$ ≥ 6 years old in household $0.072$ $0.072$ Yes $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ No $16 (680.6)$ $48 (28.9)$ $118 (71.1)$ ≥ 60 years old in household $0.0394$ Yes $108 (52.4)$ $31 (28.7)$ $77 (78.1)$	-				0.572
Single mother $0.792$ Yes $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ No $185 (89.8)$ $49 (26.5)$ $136 (73.5)$ Household size $0.006 *$ $1-2$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $1-2$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $2-5$ $131 (63.6)$ $34 (26.0)$ $97 (74.0)$ $\geq 6$ $38 (18.4)$ $4 (10.5)$ $34 (89.5)$ $\leq 6$ years old in household $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ $\geq 60$ years old in household $108 (52.4)$ $31 (28.7)$ $77 (78.1)$					
Yes $21 (10.2)$ $5 (23.8)$ $16 (76.2)$ No $185 (89.8)$ $49 (26.5)$ $136 (73.5)$ Household size $0.006 \cdot$ $1 - 2$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $3 - 5$ $131 (63.6)$ $34 (26.0)$ $97 (74.0)$ $\geq 6$ $38 (18.4)$ $4 (10.5)$ $34 (89.5)$ $\leq 6$ years old in household $0.072$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ $\geq 60$ years old in household $0.0394$ Yes $108 (52.4)$ $31 (28.7)$ $77 (78.1)$		26 (12.6)	8 (30.8)	18 (69.2)	
No185 (89.8)49 (26.5)136 (73.5)Household size $0.006 *$ 1-237 (18.0)16 (43.2)21 (56.8)3-5131 (63.6)34 (26.0)97 (74.0) $\geq 6$ 38 (18.4)4 (10.5)34 (89.5) $\leq 6$ years old in household $0.072$ Yes40 (19.4)6 (15.0)34 (85.0)No166 (80.6)48 (28.9)118 (71.1) $\geq 60$ years old in household $0.394$ Yes108 (52.4)31 (28.7)77 (78.1)	-				0.792
Household size $0.006^{\circ}$ $1-2$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $3-5$ $131 (63.6)$ $34 (26.0)$ $97 (74.0)$ $\geq 6$ $38 (18.4)$ $4 (10.5)$ $34 (89.5)$ $\leq 6$ years old in household $0.072$ $0.072$ Yes $40 (19.4)$ $6 (15.0)$ $34 (85.0)$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ $\geq 60$ years old in household $0.08 (52.4)$ $31 (28.7)$ $77 (78.1)$					
$1-2$ $37 (18.0)$ $16 (43.2)$ $21 (56.8)$ $3-5$ $131 (63.6)$ $34 (26.0)$ $97 (74.0)$ $\geq 6$ $38 (18.4)$ $4 (10.5)$ $34 (89.5)$ $\leq 6$ years old in household $6 (15.0)$ $34 (85.0)$ No $166 (80.6)$ $48 (28.9)$ $118 (71.1)$ $\geq 60$ years old in household $0.394$ Yes $108 (52.4)$ $31 (28.7)$ $77 (78.1)$ $77 (78.1)$		185 (89.8)	49 (26.5)	136 (73.5)	
$3-5$ $131$ ( $63.6$ ) $34$ ( $26.0$ ) $97$ ( $74.0$ ) $\geq 6$ $38$ ( $18.4$ ) $4$ ( $10.5$ ) $34$ ( $89.5$ ) $\leq 6$ years old in household $40$ ( $19.4$ ) $6$ ( $15.0$ ) $34$ ( $85.0$ )         Yes $40$ ( $19.4$ ) $6$ ( $15.0$ ) $34$ ( $85.0$ )         No $166$ ( $80.6$ ) $48$ ( $28.9$ ) $118$ ( $71.1$ ) $\geq 60$ years old in household $108$ ( $52.4$ ) $31$ ( $28.7$ ) $77$ ( $78.1$ )					0.006 *
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≤ 6 years old in household       0.072         Yes       40 (19.4)       6 (15.0)       34 (85.0)         No       166 (80.6)       48 (28.9)       118 (71.1)         ≥ 60 years old in household					
Yes     40 (19.4)     6 (15.0)     34 (85.0)       No     166 (80.6)     48 (28.9)     118 (71.1)       ≥ 60 years old in household     0.394       Yes     108 (52.4)     31 (28.7)     77 (78.1)		38 (18.4)	4 (10.5)	34 (89.5)	
No         166 (80.6)         48 (28.9)         118 (71.1)           ≥ 60 years old in household         0.394           Yes         108 (52.4)         31 (28.7)         77 (78.1)					0.072
≥ <b>60 years old in household</b> 0.394 Yes 108 (52.4) 31 (28.7) 77 (78.1)					
Yes 108 (52.4) 31 (28.7) 77 (78.1)		166 (80.6)	48 (28.9)	118 (71.1)	
					0.394
No 98 (47.6) 23 (23.5) 75 (76.5)					
	No	98 (47.6)	23 (23.5)	75 (76.5)	

	Descriptive analysis	Bivariat	e Analysis	р	
	n (%)	Has CHE n (%)	No CHE n (%)		
Type of cancer				0.413	
Head and neck	32 (15.5)	7 (21.9)	25 (78.1)		
Breast	68 (33.0)	16 (23.5)	52 (76.5)		
Lungs	26 (12.6)	10 (38.5)	16 (61.5)		
Gastrointestinal	34 (16.5)	8 (23.5)	26 (76.5)		
Genitourinary	32 (15.5)	7 (21.9)	25 (78.1)		
Others	14 (6.8)	6 (42.9)	8 (57.1)		
Cancer duration				0.57	
< 1 year	108 (52.4)	25 (23.1)	83 (76.9)		
1-2 years	53 (25.7)	16 (30.2)	37 (69.8)		
> 2 years	45 (21.8)	13 (28.9)	32 (71.1)		
Cancer stage				0.123	
Stage I	23 (11.2)	5 (21.7)	18 (78.3)		
Stage II	50 (24.3)	17 (34.0)	33 (66.0)		
Stage III	70 (34.0)	12 (17.1)	58 (82.9)		
Stage IV	63 (30.6)	20 (31.7)	43 (68.3)		
Current cancer treatment				0.452	
Follow-up/ symptomatic	68 (33.0)	16 (23.5)	52 (76.5)		
Chemotherapy	87 (42.2)	27 (31.0)	60 (69.0)		
Radiotherapy	48 (23,3)	11 (22.9)	37 (77.1)		
Chemo-radiotherapy	3 (1.5)	0 (0.0)	3 (100.0)		
Treatment location		. ,		0.405	
Inpatient	38 (18.4)	12 (31.6)	26 (68.4)		
	168 (81.6)	42 (25.0)	( , ,		
Outpatient	100 (01.0)	42 (23.0)	126 (75.0)		
Surgery				0.983	
Yes	118 (57.3)	31 (26.3)	87 (73.7)		
No	88 (42.7)	23 (26.1)	65 (73.9)		
Private healthcare facility				0.32	
Yes	40 (19.4)	8 (20.0)	32 (80.0)		
No	166 (80.6)	46 (27.7)	120 (72.3)		
Other chronic diseases				0.62	
Yes	120 (58.3)	33 (27.5)	87 (72.5)		
No	86 (41.7)	21 (24.4)	65 (75.6)		
Disability				0.055	
Yes	9 (4.4)	5 (55.6)	4 (44.4)		
No	197 (95.6)	49 (24.9)	148 (75.1)		
Frequency of treatment				0.307	
1x - 3x per year	5 (2.4)	0 (0.0)	5 (100.0)		
4x - 11x per year	92 (44.7)	27 (29.3)	65 (70.7)		
≥ 12x per year	109 (52.9)	27 (24.8)	82 (75.2)		
Health insurance				0.896	
Yes	116 (56.3)	30 (25.9)	86 (74.1)		
No	90 (43.7)	24 (26.7)	66 (73.3)		
Guarantee Letter				0.002	
Yes	70 (34.0)	9 (12.9)	61 (87.1)		
No	136 (66.0)	45 (33.1)	91 (66.9)		
Health financial aides				0.922	
Yes	12 (5.8)	3 (25.0)	9 (75.0)		
No	194 (94.2)	51 (26.3)	143 (73.7)		

	Simple Logistic Regression					Multiple Logistic Regression			
	В	Р	Crude OR	95% CI	В	Р	Adjusted OR	95% CI	
Marital status									
Single	1.587	0.019	4.89	1.30 – 18.38	1.429	0.088	4.18	0.81 – 21.52	
Married	0.349	0.509	1.42	0.50 - 3.99	0.62	0.332	1.86	0.53 – 6.51	
Divorced/ widowed					Reference				
Employment status									
Employed					Reference				
Self-employed	-0.658	0.096	0.52	0.24 – 1.12	-0.122	0.815	0.88	0.32 – 2.47	
Retired/ pensioner	-1.735	0.102	0.18	0.02 - 1.41	-2.409	0.062	0.09	0.01 – 1.12	
Unemployed	-0.306	0.506	0.74	0.30 - 1.82	0.392	0.478	1.48	0.50 - 4.37	
Poverty income									
Yes	1.505	< 0.001	4.51	2.33 - 8.70	1.722	< 0.001	5.60	2.34 - 13.39	
No					Reference				
Home distance from hospital									
Within Klang Valley (near)	-0.588	0.076	1.80	0.94 - 3.45	1.415	0.001	4.12	1.74 – 9.76 *	
Outside Klang Valley (far)					Reference				
Household size									
1-2	1.868	0.003	6.48	1.91 – 22.01	1.525	0.04	4.59	1.07 – 19.72	
3-5	1.092	0.053	2.98	0.98 – 9.01	0.963	0.119	2.62	0.78 - 8.80	
≥ 6					Reference				
≤ 6 years old in household									
Yes	-0.835	0.079	0.43	0.17 – 1.10	0.018	0.974	1.02	0.34 - 3.01	
No					Reference				
Disability									
Yes	1.329	0.054	3.78	0.97 – 14.62	0.831	0.322	2.30	0.44 – 11.89	
No					Reference				
Guarantee Letter									
Yes					Reference				
No	1.209	0.003	3.35	1.53 – 7.35	1.167	0.016	3.21	1.24 - 8.30 *	

Footnotes: \* Significant results

Constant value = -4.978

Enter method used in SPSS

No multicollinearity

No interaction Hosmer & Lemeshow test (P = 0.198) Classification table 81.1% correctly classified

Area under ROC 82.4 %

area under the ROC curve was 82.4%.

#### DISCUSSION

This study was conducted to look at the financial burden with regard to cancer patient's perspective. The median household expenditure of RM2637 in this study was lower than the national data of RM3654, as reported by the 2019 Household Income and Expenditure Survey (27). However, the average health expenditure in this study contributed about 9.1% from the total monthly household expenditure, which was higher compared to the national data that showed Malaysian population only spent about 5.1% of their monthly expenditure on healthcare.

There are not many studies available on CHE in Malaysia, and only a few of them involve cancer cases. Our study showed a CHE level of 26.2%, which was much higher

than 2.8% and 1.7% CHE levels reported by Sayuti & Sukeri (23) and Samsudin et al. (24) on the general and low-income Malaysian households respectively. Our CHE level was high and comparable with other CHE in cancer studies in Malaysia, for example 47.8% in a prospective study on colorectal cancer patients (16), 47.3% in a study on urologic cancer cases (17), 64% in a study on gynaecological cancer cases (18) and 86.5% in a study on oral cancer cases (19). This also corresponds to high global CHE proportion among cancer cases, as reported in other studies (28-30).

Comparing with other CHE studies involving noncancer diseases in Malaysia, our CHE level was high and comparable with those studies, for example 33% in a study on households with paediatrics acute rotavirus gastroenteritis cases (20), 16% in a study on cardiac cases hospitalized in the National Heart Institute (21) and 38% in a study on households with preterm babies admitted in two hospitals in Kedah (22). Significant robustness was observed in our study, as the CHE level only changed slightly to 33.5%, whereby the World Health Organization definition of health expenditure of more than 40% of the non-subsistence income was used for CHE.

Sociodemographic and economic statuses are important eligibility factors to be considered in planning the proposed national healthcare financing scheme to shield the needed groups from CHE (31). According to the Malaysian National Cancer Registry Report (MNCR) 2012–2016, Chinese ethnicity recorded the highest cancer incidence (26). In our study, the Malay ethnicity showed the highest proportion, the Indian ethnicity however had the highest level of CHE. This could be linked to the overall lower income, lesser financial aids, and less possession of GL among the Indian community.

At the same time, we found that a single marital status is an influencing factor in CHE, illustrating that the lack of spouse in a household is more conducive to increasing the possibility of CHE. This might be due to the fact that single individuals do not have either spouse or family members to support financially for healthcare, or because single people tend to be physically and mentally less healthy due to less social support from the spouse and family, thus increasing their expenditures for health. This result is in line with studies which showed single unmarried respondents have higher CHE (25,32-34) and different from studies which showed married households were more likely to incur CHE (35-37).

The National Cancer Institute (NCI) is the main national referral centers for oncology cases in Malaysia. Therefore, cancer patients from all over the country (within or outside Klang Valley) came to NCI for cancer treatment. The result showed that there were no significant differences in CHE between the within Klang Valley (KV) and outside KV groups. The within KV group however had four times more probability of developing CHE. In terms of distance from home to health facility, this is opposed to studies which showed distance to health facility is associated with an increased likelihood of CHE (38-40), highlighting the significance of distance in increasing cost of access to healthcare. This opposing result is probably due to the overall higher cost of living in the KV area, as compared to the outside KV area.

The Employee Provident Fund (41) reported that unmarried Malaysians in KV area need up to RM2,240 per month compared to RM2,038 for single Malaysians in general, whereas married couples need more to maintain an acceptable standard of living, with the minimum expenditure required increasing to RM4,420. Having children raises the required expenditure level even more, to RM5,730 by having just one child and to RM6,620 by having two children. The report also estimates the monthly expenditure for senior couples at RM3,090. At RM2,240, the minimum income required by a single Malaysian living in the KV area is higher than the current minimum wage of RM1,100, but lower than the median wage of RM2,580 in Selangor or RM2,650 in Kuala Lumpur.

The Department of Statistics Malaysia (2019) reported that there were 7.28 million households in Malaysia and the average household size in Malaysia was 3.9. The majority of respondents in this study had mediumsized household, however the CHE percentage was the highest in smaller-sized household group. This result corresponds with a study by Adisa (42), which showed higher CHE with smaller-sized household. Conversely, studies conducted by Dyer et al. (43) and Shi et al. (44) reported higher CHE with larger-sized household. A small household will most likely generates smaller income, leading to higher risk of CHE if their health expenditure is relatively large.

It is to be expected that more patients in the lower income group attended the National Cancer Institute (NCI) for treatment since NCI is a public hospital, which is highly subsidized by the government. Sharifa Ezat et al. (45 p. 2) reported that "individuals from the lower socioeconomic status (SES) background tend to use public health services more than individuals from higher SES background, which might be a direct result of their lower income status, or due to a broader social phenomenon". The poverty income group showed a higher CHE and the poverty income group had four times more probability of developing CHE compared to the non-poverty income group. These results are consistent with studies by Daivadanam et al. (46) and Brinda et al. (47), which showed that the financial burden is higher in lower income level group. This group of patients has a higher risk of developing CHE since cancer treatments are often expensive and sometimes part of the costs need to be paid by out-of-pocket (OOP), despite the government subsidies.

Another variable was the usage of a Guarantee Letter (GL), whereby the employer or organization will cover all or part of the treatment costs and the patient does not have to pay any direct treatment costs. All government agencies and some private companies provide GL, which offers medical coverage for their employees and often for the employees' immediate families too. Apart from that, government pensioners are also covered by GL in the form of a pensioner's card. In this study, the percentage of respondents with GL was 34%, which was slightly higher than the national data of 22.5% in the 2019 HIES (27). Lack of GL is considered to be an important influencing factor for CHE, whereby the results showed higher CHE and three times more probability of developing CHE in this group.

The biggest limitation of this study is because the study was only done in one center which is NCI, thus the findings of this study cannot be inferred to the population as only one center was utilized. Other limitations include selection and recall biases due to the study's design and methods. A nationwide study involving more hospitals with a higher number of samples or a prospective study with larger-sized samples is probably the way forward for future studies related to this topic.

# CONCLUSION

This study showed a higher CHE level, similar to other studies which investigated the association between CHE and cancer. The risk factors associated with CHE in cancer cases and the significant predicting factors for CHE were identified. Knowing the significant association and predicting factors of CHE in cancer patients could assist to identify which groups of cancer patients should be targeted and how much support are required by them under the current healthcare budget and in future national social health insurance, if it is to be formulated.

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