ORIGINAL ARTICLE

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

Sharifa Ezat Wan Puteh, Yang Rashidi Abdullah, Azimatun Noor Aizuddin

Department of Public Health Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia, Hospital Canselor Tuanku Muhriz (HCTM) Jalan Yaacob Latif, Bandar Tun Razak, 56000 Kuala Lumpur, WP Kuala Lumpur, Malaysia.

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.
Malaysian Journal of Medicine and Health Sciences (2024) 20(1):21-29. doi:10.47836/mjmhs.20.1.4

Keywords: Health expenditure, Catastrophic Health Expenditure, Cancer, National Cancer Institute Malaysia

Corresponding Author:
Yang Rashidi Abdullah, MBBS
Email: dr.yrashidi@moh.gov.my
Tel: +60193304630

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 two-ways 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 data

	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)

	Descriptive analysis n (%)	Bivariate Analysis		p
		Has CHE n (%)	No CHE n (%)	
Gender				0.358
Male	92 (44.7)	27 (29.3)	65 (70.7)	
Female	114 (55.3)	27 (23.7)	87 (76.3)	
Age				0.546
18-39	38 (18.4)	9 (23.7)	29 (76.3)	
40-59	93 (45.1)	22 (23.7)	71 (76.3)	
≥ 60	75 (36.4)	23 (30.7)	52 (69.3)	
Ethnicity				0.017 *
Malay	120 (58.3)	22 (18.3)	98 (81.7)	
Chinese	46 (22.3)	17 (37.0)	29 (63.0)	
Indian	35 (17.0)	14 (40.0)	21 (60.0)	
Others	5 (2.4)	1 (20.0)	4 (80.0)	
Marital status				0.019 *
Single	19 (9.2)	10 (52.6)	9 (47.4)	
Married	160 (77.7)	39 (24.4)	121 (75.6)	
Divorced/ widowed	27 (13.1)	5 (18.5)	22 (81.5)	
Education level				0.644
None	8 (3.9)	1 (12.5)	7 (87.5)	
Primary school	43 (20.9)	12 (27.9)	31 (72.1)	
Secondary school	89 (43.2)	26 (29.2)	63 (70.8)	
University/ college	66 (32.0)	15 (22.7)	51 (77.3)	
Employment 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)	1 (7.7)	12 (92.3)	
Unemployed	106 (51.5)	8 (25.8)	23 (74.2)	
Poverty income				< 0.001 *
Yes	66 (32.0)	31 (47.0)	35 (53.0)	
No	140 (68.0)	23 (16.4)	117 (83.6)	
Home distance from hospital				0.074
Within 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				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				0.792
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	38 (18.4)	4 (10.5)	34 (89.5)	
≤ 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				0.394
Yes	108 (52.4)	31 (28.7)	77 (78.1)	
No	98 (47.6)	23 (23.5)	75 (76.5)	

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

	Descriptive analysis n (%)	Bivariate Analysis		p
		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)	
Outpatient	168 (81.6)	42 (25.0)	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)	

* Significant results

Table III: Logistic Regression of the study population (n = 206)

	Simple Logistic Regression				Multiple Logistic Regression			
	B	P	Crude OR	95% CI	B	P	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 non-cancer 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 medium-sized 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.

ACKNOWLEDGEMENTS

REFERENCES

1. Sharifa Ezat WP, Azimatun NA, Zainuddin Z, et al. Catastrophic Health Expenditure and its influencing factors in Malaysia. BMC Health Services Research. 2012; 12 Suppl 1:2. doi: 10.1186/1472-6963-12-S1-P2.
2. Wagstaff A. Measuring Equity in Health Care Financing: Reflections on and Alternatives to the World Health Organization's Fairness of Financing Index. Policy Research Working. 2003; 2550:1-24. doi: 10.1596/1813-9450-2550.
3. Xu K, Evans DB, Carrin G, et al. Protecting Households from Catastrophic Health Spending. Health Aff (Millwood). 2007; 26(4):972-983. doi: 10.1377/hlthaff.26.4.972.
4. Database of global cancer data [Internet]. Geneva: WHO International Agency for Research on Cancer; 2020 (cited 2021 June 23]. Available from: https://www.uicc.org/news/globocan-2020-new-global-cancer-data.
5. Xu K. Distribution of health payments and catastrophic expenditures methodology. InDistribution of health payments and catastrophic expenditures Methodology 2005.
6. Pradhan M & Prescott N. Social risk management options for medical care in Indonesia. Health Economics. 2002; 11(5):431-446. doi: 10.1002/hec.689.
7. Onoka CA, Onwujekwe OE, Hanson K, Uzochukwu BS. Examining catastrophic health expenditures at variable thresholds using household consumption expenditure diaries. Trop Med Int Health. 2011; 16(10):1334-41. doi: 10.1111/j.1365-3156.2011.02836.x.
8. Xu K, Evans DB, Kawabata K, et al. Household Catastrophic Health Expenditure: A Multicountry Analysis. The Lancet. 2003; 362(9378):111-117. doi: 10.1016/S0140-6736(03)13861-5.
9. Ministry of Health. Malaysian National Health Accounts Health Expenditure Report 1997-2019 MOH Planning Division 2021. Report No: MOH/S/RAN/198.21(AR)-e.
10. Sharifa Ezat WP, Azimatun NA & Abdulaziz AAS. Renewal of Healthcare Funding Systems by National Health Insurance in the Kingdom of Saudi Arabia (NHI). Haya: The Saudi Journal of Life Sciences. 2020; 5(11):236-245. doi: 10.36348/sjls.2020.v05i11.001.
11. Sharifa Ezat WP & Almualm Y. Catastrophic Health Expenditure among Developing Countries. Health Systems and Policy Research. 2017; 04(01). doi: 10.21767/2254-9137.100069.
12. Moreno-Serra R & Smith PC. Does progress towards universal health coverage improve population health?. The Lancet. 2012; 380(9845):917–923. doi: 10.1016/S0140-6736(12)61039-3.
13. International Labour Organization (ILO) Social Protection [Internet]. Financing Health Protection: Financing Sources. 2022 (cited 2022 Oct 21). Available from: https://www.social-protection.org/gimi/ShowWiki.action?id=2521.
14. World Health Organization. Validity and comparability of out-of-pocket health expenditure from household surveys: a review of the literature and current survey instruments. 2011 WHO Discussion Paper Number 1-2011.
15. Xu K, Evans D, Carrin G, Aguilar-Rivera AM. Designing health financing systems to reduce catastrophic health expenditure. 2005. WHO Technical Briefs for Policy-Makers Number 2-2005.
16. Azzani M, Abqariyah Y, April CR, et al. Catastrophic Health Expenditure among Colorectal Cancer Patients and Families: A Case of Malaysia. Asia Pacific Journal of Public Health. 2017; 29(6):485-494. doi: 10.1177/1010539517732224.
17. Ting CY, Teh GC, Yu KL, et al. Self-perceived burden and its associations with health-related quality of life among urologic cancer patients. European Journal of Cancer Care. 2020; 29(4):1-12. doi: 10.1111/ecc.13248.
18. Liew CH, Shabaruddin FH & Dahlui M. The Burden of Out-of-Pocket Expenditure Related to Gynaecological Cancer in Malaysia. Healthcare. 2022; 10(10):2099. doi: 10.3390/healthcare10102099.
19. Raman S, Shafie AA, Abraham MT, et al. Household Catastrophic Health Expenditure from Oral

Potentially Malignant Disorders and Oral Cancer in Public Healthcare of Malaysia. Asian Pacific Journal of Cancer Prevention. 2022; 23(5):1611-1618. doi: 10.31557/APJCP.2022.23.5.1611.

20. Loganathan T, Lee WS, Lee KF, et al. Household Catastrophic Healthcare Expenditure and Impoverishment Due to Rotavirus Gastroenteritis Requiring Hospitalization in Malaysia. PLoS One. 2015; 10(5): e0125878. doi: 10.1371/journal.pone.0125878.

21. Sukeri S, Mirzaei M & Jan S. Does tax-based health financing offer protection from financial catastrophe? Findings from a household economic impact survey of ischaemic heart disease in Malaysia. International Health. 2016; 9(1): 29–35. doi: 10.1093/inthealth/ihw054.

22. Zainal H, Dahlui M & Su TT. Financial implications of preterm birth during initial hospitalization: The extent and predictors of catastrophic health expenditure. BioRxiv. 2019; 532697. doi: 10.1101/532697.

23. Sayuti M & Sukeri S. Assessing progress towards Sustainable Development Goal 3.8. 2 and determinants of catastrophic health expenditures in Malaysia. Plos one. 2022; 17(2):e0264422. doi: 10.1371/journal.pone.0264422.

24. Samsudin K, Mahmud A & Hamedon TR. Incidence and determinants of catastrophic health expenditure among low-income Malaysian households. MJM. 2022; 77(4):474.

25. ACTION Study Group mkimman@ georgeinstitute.org. au. Catastrophic health expenditure and 12-month mortality associated with cancer in Southeast Asia: results from a longitudinal study in eight countries. BMC Medicine. 2015; 13:1-11. doi: 10.1186/s12916-015-0433-1.

26. Azizah AM, Hashimah B, Nirmal K, et al. Malaysian National Cancer Registry Report 2012-2016: Malaysia cancer statistics, data and figure. National Cancer Institute: Ministry of Health Malaysia. 2019; Report No.: MOH/P/IKN/0.5-19 (AR).

27. Household Income & Expenditure Survey 2019 [Internet]. Putrajaya: Department of Statistics Malaysia; 2020 (cited 2021 June 23). Available from: https://www.dosm.gov.my/v1/index.php.

28. Choi JW, Choi JW, Kim JH, et al. Association between Chronic Disease and Catastrophic Health Expenditure in Korea. BMC Health Serv Res. 2015; 15(26):1-8. doi: 10.1186/s12913-014-0675-1.

29. Kavosi Z, Delavari H, Keshtkaran A, et al. Catastrophic Health Expenditures and Coping Strategies in Households with Cancer Patients in Shiraz Namazi Hospital. Middle East Journal of Cancer. 2014; 5(1):13-22.

30. Piroozi B, Moradi G, Nouri B, et al. Catastrophic Health Expenditure after the Implementation of Health Sector Evolution Plan: A Case Study in the West of Iran. Int J Health Policy Manag. 2016; 5(7):417-423. doi: 10.15171/ijhpm.2016.31.

31. Azimatun NA, Aljunid SM. Ability to Pay for Future National Health Financing Scheme among Malaysian Households. Annals of Global Health. 2017; 83(3-4):654-660. doi: 10.1016/j.aogh.2017.10.002.

32. Rai S, Gautam S, Yadav GK, et al. Catastrophic health expenditure on chronic non communicable diseases among elder population: A crosssectional study from a sub-metropolitan city of Eastern Nepal. PLoS ONE. 2022; 17(12): e0279212. doi: 10.1371/journal.pone.0279212.

33. Wang J, Tan X, Qi X, Zhang X, et al. Minimizing the risk of catastrophic health expenditure in China: a multi-dimensional analysis of vulnerable groups. Frontiers in Public Health. 2021; 9:689809. doi: 10.3389/fpubh.2021.689809.

34. Iamshchikova M, Mogilevskii R & Onah MN. Trends in out of pocket payments and catastrophic health expenditure in the Kyrgyz Republic post "Manas Taalimi" and "Den Sooluk" health reforms, 2012–2018. International Journal for Equity in Health. 2021; 20(1):1-7. doi: 10.1186/s12939-020-01358-2.

35. Shumet Y, Mohammed SA, Kahissay MH & Demeke B. Catastrophic health expenditure among chronic patients attending Dessie Referral Hospital, Northeast Ethiopia. ClinicoEconomics and Outcomes Research. 2021; 13:99-107. doi: 10.2147/CEOR.S291463.

36. Noviani A. Who Have a Higher Risk of Falling Into Catastrophic Health Expenditures?. Jurnal Ilmu Kesehatan Masyarakat. 2021; 12(3):217-228. doi: 10.26553/jikm.2021.12.3.217-228.

37. Lee M, Yoon K & Choi M. Private health insurance and catastrophic health expenditures of households with cancer patients in South Korea. European journal of cancer care. 2018; 27(5):e12867. doi: 10.1111/ecc.12867.

38. Arsenault C, Fournier P, Philibert A, Sissoko K, Coulibaly A, Tourigny C, et al. Emergency obstetric care in Mali: catastrophic spending and its impoverishing effects on households. Bull World Health Organ. 2013; 91:207–16. doi: 10.2471/BLT.12.108969.

39. Masiye F, Kaonga O, Kirigia JM. Does user fee removal policy provide financial protection from catastrophic health care payments? Evidence from Zambia. PloS One. 2016; 11(1):1-15. e0146508. doi: 10.1371/journal.pone.0146508.

40. Njagi P, Arsenijevic J, Groot W. Understanding variations in catastrophic health expenditure, its underlying determinants and impoverishment in sub-Saharan African countries: a scoping review. Systematic reviews (Springer link). 2018; 7(136):1-23. doi: 10.1186/s13643-018-0799-1.

41. Employees Provident Fund (EPF) in collaboration with University of Malaya & Social Wellbeing Research Centre [Internet]. Belanjawanku:

Expenditure Guide for Malaysian Individuals & Families (Klang Valley). 2019 (cited 2022 Oct 21). Available from: https://www.kwsp.gov.my/documents/20126/131635/Panduan_Belanjawanku.pdf/76872674-983a-3860-19a3-c47d2d2d2ab6.

42. Adisa O. Investigating Determinants of Catastrophic Health Spending among Poorly Insured Elderly Households in Urban Nigeria. Int J Equity Health. 2015; 14(79):1-11. doi: 10.1186/s12939-015-0188-5.

43. Dyer SJ, Sherwood K, Mcintyre D. et al. Catastrophic Payment for Assisted Reproduction Techniques with Conventional Ovarian Stimulation in the Public Health Sector of South Africa: Frequency and Coping Strategies. Hum Reprod. 2013; 28(10):2755-2764. doi: 10.1093/humrep/det290.

44. Shi W, Chongsuvivatwong V, Geater A, et al. Effect of household and village characteristics on financial catastrophe and impoverishment due to health care spending in Western and Central Rural China: A multilevel analysis. Health Research Policy and Systems. 2011; 9(16):1-10.

45. Sharifa Ezat WP, Siwar C, Mohd ASZ, et al. Health related quality of life (HRQOL) among low socioeconomic population in Malaysia. BMC Public Health. 2019; 19(551):1-8. doi: 10.1186/s12889-019-6853-7.

46. Daivadanam M, Thankappan KR, Sarma PS, et al. Catastrophic Health Expenditure & Coping Strategies Associated with Acute Coronary Syndrome in Kerala, India. Indian J Med Res. 2012; 136(4):585-592.

47. Brinda EM, Andrūs RA & Enemark U. Correlates of out-of-pocket and catastrophic health expenditures in Tanzania: results from a national household survey. BMC International Health and Human Rights. 2014; 14(5):1-8. doi: 10.1186/1472-698X-14-5.