RESEARCH ARTICLE

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Catastrophic Health Expenditure (CHE) among Cancer Population in a Middle Income Country with Universal Healthcare Financing

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Abstract

Background: The study investigated healthcare expenditure from the perspective of cancer patients, to determine the level of Catastrophic Health Expenditure (CHE) and its associated factors. **Methods:** This cross-sectional study was conducted in three Malaysian public hospitals namely Hospital Kuala Lumpur, Hospital Canselor Tuanku Muhriz and the National Cancer Institute using a multi-level sampling technique to recruit 630 respondents from February 2020 to February 2021. CHE was defined as incurring a monthly health expenditure of more than 10% of the total monthly household expenditure. A validated questionnaire was used to collect the relevant data. **Results:** The CHE level was 54.4%. CHE was higher among patients of Indian ethnicity (P = 0.015), lower level education (P = 0.001), those unemployed (P < 0.001), lower income (P < 0.001), those in poverty (P < 0.001), those staying far from the hospital (P < 0.001), living in rural areas (P = 0.003), small household size (P = 0.029), moderate cancer duration (P = 0.030), received radiotherapy treatment (P < 0.001), had very frequent treatment (P < 0.001), and without a Guarantee Letter (GL) (P < 0.001). The regression analysis identified significant predictors of CHE as lower income aOR 18.63 (CI 5.71–60.78), middle income aOR 4.67 (CI 1.52–14.41), poverty income aOR 4.66 (CI 2.60–8.33), staying far from hospital aOR 2.62 (CI 1.58–4.34), chemotherapy aOR 3.70 (CI 2.01–6.82), radiotherapy aOR 2.99 (CI 1.37–6.57), combination chemo-radiotherapy aOR 4.99 (CI 1.48–16.87), health insurance aOR 3.99 (CI 2.31–6.90), without GL aOR 3.38 (CI 2.06–5.40), and without health financial aids aOR 2.94 (CI 1.24–6.96). **Conclusions:** CHE is related to various sociodemographic, economic, disease, treatment and presence of health insurance, GL and health financial aids variables in Malaysia.

Keywords: Catastrophic Health Expenditure- CHE- CHE in cancer- CHE in Malaysia

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Introduction

Catastrophic Health Expenditure (CHE) refers to any healthcare expenditures incurred to meet and maintain the healthcare needs of a household that can result in a threat to its financial capacity and capability (Sharifa Ezat et al., 2012). CHE also occurs when the out-of-pocket (OOP) payment for healthcare expenditure exceeds a certain threshold of household income or expenditure. There are various threshold levels and definitions used to define CHE. Onoka et al., (2011) has indicated threshold levels of CHE from 5% to 40%. Kimman et al., (2015) utilized a threshold level of 30% from the total household income to define CHE. Wagstaff et al., (2017) defined health spending as catastrophic when it exceeded 10% or 25% of household consumption. 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.

Globally, healthcare expenditure can be funded by one of the four health financing mechanisms, namely taxation, social health insurance, private insurance, and Out-of-Pocket (OOP) (Sharifa Ezat and Almualm, 2017). OOP is the only mechanism that relies on the post-payment method, thus making it the least efficient mechanism of healthcare financing. In comparison, pre-payment methods are considered more favourable and effective because they enable financial risk-sharing among the subscribers or community members, subsequently protecting them from the effects of CHE (Moreno-Serra and Smith, 2012).

CHE knows no boundary. It can occur in developed, developing, and poor countries. CHE was less than 0.5% in most developed countries like Sweden, Canada, the United Kingdom, France, and Germany (Xu et al., 2003). In contrast, the effect of CHE is more profound in poor and developing countries. More than 90% of the

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patients in these countries rely on OOP entirely as they do not have access to pre-payment healthcare financing mechanisms (Xu et al., 2007). They face a high risk of CHE due to poverty and an absence of proper health financing mechanisms.

Malaysia is a multi-racial middle-income country located in South East Asia with a total population of 32.73 million and a GDP of 4.3%. The last reported OOP for healthcare services was 35.1%, thus putting some of the Malaysian population at a high risk of CHE (DOSM, 2020). The Malaysian public healthcare sector is mainly funded via global taxation while the private sector is mainly financed via OOP (Sharifa Ezat et al., 2020). In addition, cancer is among the leading causes of morbidity and mortality worldwide. In 2020, the World Health Organization reported 19.3 million cancer cases and 10 million cancer deaths globally (WHO IARC, 2020). The number of new cancer cases in Malaysia was 48,639 in 2020 and these numbers were expected to increase significantly with the increase in ageing population, unhealthy lifestyles and increasing exposure to carcinogens due to modernization processes.

To date, only a few small studies on CHE among cancer patients are available in Malaysia, for example on colorectal cancer patients (Azzani et al., 2017), urologic cancer cases (Ting et al., 2020), gynaecological cancer cases (Liew et al., 2022) and oral cancer cases (Raman et al., 2022). The only large-scale CHE-related study in Malaysia was conducted by Kimman et al., (2015), as part of a larger study in South East Asia. Therefore, we aimed to address the existing gaps by determining the CHE among cancer patients in three Malaysian hospitals. The outcome of the study will be important in the preparation of healthcare budget allocations for cancer care, as well as the inclusion of comprehensive cancer care in the national social health insurance scheme.

Materials and Methods

The study was conducted in three Malaysian public hospitals with oncology services, namely National Cancer Institute (NCI), Hospital Kuala Lumpur (HKL), and Hospital Canselor Tuanku Muhriz (HCTM). All three centers are located in the Klang Valley (KV), i.e. the central region of Peninsular Malaysia, in which 30% of all cancer cases in Malaysia are treated based on a recent report (Azizah et al., 2019). The three hospitals are the designated national referral centers equipped with radiotherapy, oncology, and palliative care departments to provide care for cancer patients in the country.

This cross-sectional study was conducted from February 2020 to February 2021. A multilevel sampling method was applied. First, the hospitals were chosen using convenient sampling. This was followed by a purposive sampling of the oncology department as well as the universal sampling of patients at the inpatient and outpatient services of the oncology department. Subsequently, a systematic sampling of patients from the department was performed to recruit the study participants.

Ward admission lists and patient attendance records at the clinics and day care centers were obtained to recruit 630 patients. The sample size of 630 was calculated using the Lwanga dan Lemeshow (1991) formula. Informed consent was obtained from the respondents. Confidentiality was reassured. The study received ethical clearance from the Malaysian Research Ethical Committee and permission to conduct data collection from the respective hospital directors.

Data collection was done by interviews with patients using a validated questionnaire. The questionnaire was self-developed and consisted of four domains, namely the sociodemographic and economic domain, the disease and treatment domain, the health financing domain and the health insurance domain. All the sources of household income and household expenses including the health expenses were accounted for in the economic and health financing domains of the questionnaire. All income and expenditure were stated in Malaysian Ringgit (RM) and converted to US dollar ($) currency (RM1 = US$0.24). 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. A document review of the patient's case notes and interview of the patient's caretakers were also done if additional data was required.

The inclusion criteria of study participants were Malaysian citizens, aged 18 and above, with any type or stage of cancer. Patients who did not give consent, as well as those who were mentally unstable, unconscious, or unable to communicate were excluded. CHE was defined as incurring a monthly health expenditure of more than 10% of the total monthly household expenditure. Household income groups were categorized into low income (B40), middle income (M40), and high income (T20). Poverty income was defined as households with income of less than RM 2208 (USD 530.32) per month (DOSM, 2020).

In addition, the Guarantee Letter (GL) is a document of assurance offered by the employer or insurer confirming that part of or all the cost of treatment for the patient will be taken care of by the company. It serves as a waiver of hospital treatment payment for the patient. Next, health financial aid is defined as any financial assistance or contribution from family, friends, government organizations, or non-governmental organizations specifically to pay for healthcare services. It can be in the form of monetary assistance, payment guarantees, cost-sharing arrangements, subsidies, or welfare payments.

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.

Results

Descriptive Analysis

In this study, more than half (54.4%) of the respondents experienced CHE. The mean age of the respondents was 54.25 years old (SD ±12.52) and the mean household size was 4.1 (SD ±1.84). Table 1 reveals the mean, median, standard deviation and interquartile values of the age, household size, income and expenditures of the respondents. The monthly median income, household expenditure, healthcare expenditure, direct, and indirect health expenditures were US$797 (IQR = 840), US$621 (IQR = 592), US$84 (IQR = 106), US$29 (IQR = 60) and US$24 (IQR = 39) respectively. (US$1 = RM4.17)

Bivariate Analysis

Based on Table 2, the bivariate analysis results show that CHE was significantly higher among respondents with an Indian ethnicity 67.1% (P = 0.015) compared to Malay, Chinese and other ethnicities; primary school (lower level) education 68.8% (P = 0.001) compared to no education, secondary school and university/ college level educations; unemployed status 64.3% (P < 0.001) compared to employed, self-employed and retiree/ pensioner statuses; lower income 67.2% (P < 0.001) compared to middle and higher incomes; and poverty income 78.8% (P < 0.001) compared to non-poverty income.

Other significant factors associated with CHE included those staying far away from the hospital 65.8% (P < 0.001) compared to staying near to hospital; living in rural areas 67.6% (P = 0.003) compared to urban areas; small household size 64.7% (P = 0.029) compared to medium and large household sizes; moderate cancer duration 61.0% (P = 0.030) compared to short and long cancer durations; radiotherapy treatment 66.9% (P < 0.001) compared to follow-up/ symptomatic, chemotherapy and combination chemo-radiotherapy treatments; very frequent treatment 63.6% (P < 0.001) compared to infrequent and frequent treatments; and without GL 67.0% (P < 0.001) compared to with GL.

Multivariate Analysis

In Table 3, the logistic regression analysis showed a significant relationship between CHE and respondents of lower income aOR 18.63 (CI 5.71–60.78), middle income aOR 4.67 (CI 1.52–14.41), poverty income aOR 4.66 (CI 2.60–8.33), as well as those staying far from the hospital aOR 2.62 (CI 1.58–4.34). Other predictors of CHE included respondents receiving chemotherapy aOR 3.70 (CI 2.01–6.82), radiotherapy aOR 2.99 (CI 1.37–6.57), or combined chemo-radiotherapy treatments aOR 4.99 (CI 1.48–16.87). Those with health insurance aOR 3.99 (CI 2.31–6.90), without GL aOR 3.38 (CI 2.06–5.40), and without health financial aids aOR 2.94 (CI 1.24–6.96) were also significantly predisposed to CHE. The logistic regression analysis had a good Nagelkerke R^2 value of 0.68.

Discussion

This study investigated CHE from the perspective of cancer patients, instead of the perspective of health service providers. The CHE level in this study was high and comparable with other CHE in cancer studies in Malaysia, for example 47.8% in Azzani et al., (2017) study, 47.3% in Ting et al., (2020) study, 64% in Liew et al., (2022) study and 86.5% in Raman et al., (2022) study. This also corresponds to high global CHE proportion amongst cancer cases, as reported in other studies (Kavosi et al., 2014; Choi et al., 2015; Piroozi et al., 2016). Our CHE level was also high and comparable with other CHE studies involving non-cancer diseases in Malaysia, for example 33% in a study on households with paediatrics acute rotavirus gastroenteritis cases (Loganathan et al., 2015), 16% in a study on cardiac cases hospitalized in the National Heart Institute (Sukeri et al., 2016) and 38% in a study on households with preterm babies admitted in two hospitals in Kedah (Zainal et al., 2019). Even when we converted to the WHO's definition of CHE (health expenditure of more than 40% of the non-subsistence income), the prevalence of CHE among our study respondents remained high at 52.2%.

We reported both direct and indirect health expenditures to provide a comprehensive picture of the financial burden related to cancer care. The results show that the direct expenditure was minimal in the studied facilities, likely due to the government healthcare subsidies for all citizens. The median household expenditure in this study was slightly lower than US$877 reported in the 2019 Household Income and Expenditure Survey (HIES) (DOSM, 2020). Furthermore, the average monthly healthcare expenditure accounted for 13.5% of the total average household expenditure, which was higher than the

Table 1. Income and Expenditure Data Related to Cancer Patients in Malaysia, 2021

				Interquartile Range		
	Mean	Median	SD	25th	50th	75th
Age	54.25	56.00	12.52	46.00	56.00	64.00
Household size	4.1	4.0	1.84	3.0	4.0	5.0
Monthly income (US$)	1049	797	876	480	797	1320
Monthly expenditure (US$)	753	621	556	379	621	971
Monthly health expenditure (US$)	134	84	182	48	84	154
Direct health expenditure (US$)	61	29	153	0	29	60
Indirect health expenditure (US$)	50	24	71	12	24	51

* US$1, RM4.17; SD, Standard Deviation

Table 2. Descriptive and Bivariate Analysis of the Study Population (n = 630)

	Descriptive Analysis	Bivariate Analysis		
	n (%)	CHE n (%)	No CHE n (%)	p-value
Ethnicity				0.015*
Malay	439 (69.7)	223 (50.8)	216 (49.2)	
Chinese	106 (16.8)	66 (62.3)	40 (37.7)	
Indian	73 (11.6)	49 (67.1)	24 (32.9)	
Others	12 (1.9)	5 (41.7)	7 (58.3)	
Education level				0.001*
No education	18 (2.9)	11 (61.1)	7 (38.9)	
Primary school	109 (17.3)	75 (68.8)	34 (31.2)	
Secondary school	320 (50.8)	174 (54.4)	146 (45.6)	
University/ college	183 (29.0)	83 (45.4)	100 (54.6)	
Employment status				< 0.001*
Employed	164 (26.0)	73 (44.5)	91 (55.5)	
Self-employed	38 (6.0)	21 (55.3)	17 (44.7)	
Retiree/ pensioner	106 (16.8)	42 (39.6)	64 (60.4)	
Unemployed	322 (51.1)	207 (64.3)	115 (35.7)	
Income group				< 0.001*
B40 (lower)	411 (65.2)	276 (67.2)	135 (32.8)	
M40 (middle)	183 (29.0)	61 (33.3)	120 (66.3)	
T20 (higher)	36 (5.7)	6 (15.8)	32 (84.2)	
Poverty income				
Yes	203 (32.2)	160 (78.8)	43 (21.2)	
No	427 (67.8)	183 (42.9)	244 (57.1)	
Home distance from hospital				
Within Klang Valley (near)	396 (62.9)	189 (47.7)	207 (52.3)	
Outside Klang Valley (far)	234 (37.1)	154 (65.8)	80 (34.2)	
Home area				
Rural	108 (17.1)	73 (67.6)	35 (32.4)	
Urban	522 (82.9)	270 (51.7)	252 (48.3)	
Household size				0.029*
1-2 (small)	133 (21.1)	86 (64.7)	47 (35.3)	
3-6 (medium)	435 (69.0)	225 (51.7)	210 (48.3)	
> 6 (large)	62 (9.8)	32 (51.6)	30 (48.4)	
Cancer duration				0.030*
< 1 year (short)	323 (51.3)	182 (56.3)	141 (43.7)	
1-2 years (medium)	123 (19.5)	75 (61.0)	48 (39.0)	
> 2 years (long)	184 (29.2)	86 (46.7)	98 (53.3)	
Current cancer treatment				
Follow-up/ symptomatic	186 (29.5)	70 (37.6)	116 (62.4)	
Chemotherapy	281 (44.6)	164 (58.4)	117 (41.6)	
Radiotherapy	127 (20.2)	85 (66.9)	42 (33.1)	
Chemo-radiotherapy	36 (5.7)	24 (66.7)	12 (33.3)	
Frequency of treatment (per year)				
1x - 3x (infrequent)	61 (9.7)	17 (27.9)	44 (72.1)	
4x - 11x (frequent)	327 (51.9)	172 (52.6)	155 (47.4)	
≥ 12x (very frequent)	242 (38.4)	154 (63.6)	88 (36.4)	
Guarantee Letter (GL)				
Yes	251 (39.8)	89 (35.5)	162 (64.5)	
No	379 (60.2)	254 (67.0)	125 (33.0)	

* significant results ($p < 0.05$)

Table 3. Logistic Regression of the Study Population (n = 630)

	Simple Logistic Regression			Multiple Logistic Regression		
	cOR	95% CI	p-value	aOR	95% CI	p-value
Income group						
B40 (lower)	10.9	4.45-26.71	< 0.001	18.63	5.71–60.78	< 0.001 *
M40 (middle)	2.71	1.07-6.84	0.035	4.67	1.52–14.41	0.01 *
T20 (higher)			Reference			
Poverty income						
Yes	4.96	3.37-7.31	< 0.001	4.66	2.60–8.33	< 0.001 *
No			Reference			
Home distance from the hospital						
Within Klang Valley (near)			Reference			
Outside Klang Valley (far)	2.11	1.51-2.95	< 0.001	2.62	1.58–4.34	< 0.001 *
Current cancer treatment						
Follow-up/ symptomatic			Reference			
Chemotherapy	2.32	1.59-3.40	< 0.001	3.70	2.01–6.82	< 0.001 *
Radiotherapy	3.35	2.09-5.39	< 0.001	2.99	1.37–6.57	0.01 *
Chemo-radiotherapy	3.31	1.56-7.04	0.002	4.99	1.48–16.87	0.01 *
Health insurance						
Yes	1.13	0.82-1.57	0.456	3.99	2.31–6.90	< 0.001 *
No			Reference			
Guarantee Letter						
Yes			Reference			
No	3.7	2.64-5.17	< 0.001	3.38	2.06–5.40	< 0.001 *
Health financial aids						
Yes			Reference			
No	0.85	0.46-1.59	0.615	2.94	1.24–6.96	0.01 *

*, significant results; cOR, Crude Odds Ratio; aOR, Adjusted Odds Ratio

5.1% reported in the 2019 HIES report. This makes sense because comparing to the national data, the respondents who came to these public hospitals were mainly of lower socioeconomic status and the higher percentage of healthcare expenditure was justifiable due to higher cost of treatment for cancer disease.

According to the Malaysian National Cancer Registry Report (MNCR) 2012–2016, Chinese ethnicity recorded the highest cancer incidence (Azizah et al., 2019). In our study, 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. With regard to education level, the majority of the respondents attained a secondary school level of education. The literacy rate of 97.1% and tertiary level education rate of 29.0% in this study were in line with the Malaysian national data of 97.3% and 21.6% respectively (DOSM, 2015). Individuals with lower education levels are commonly linked with unemployment and/or holding low-income jobs. In this study, the CHE prevalence was higher among respondents with a lower level of education (primary school and non-schooling). The finding was in line with Rivero et al., (2006) which reported a high CHE among the less educated group.

The official retirement age in Malaysia is 60 years old. However, the majority of the respondents in this study were unemployed even though their mean age was 54.2 years. CHE was higher among the unemployed group in our study, consistent with Kimman et al., (2012) and Li et al., (2012) studies. As cancer symptoms and side effects of cancer treatment can often be debilitating, many patients become unable to work, thus losing the means to generate income. Buigut et al., (2015) also reported a lower CHE prevalence when there were more household members with employment.

In this study, the majority of the respondents were in the lower-income (B40) group. Sharifa Ezat et al., (2019) reported that individuals from lower socioeconomic status (SES) backgrounds tend to use public health services due to their low-income status. The same finding was observed among the group with the poverty income whereby they were four times more likely to develop CHE than those not in the poverty income group. The finding was consistent with Daivadanam et al., (2012) and Brinda et al., (2014) studies that reported a higher financial burden among the lower-income group. Additionally, the middle-income (M40) group also showed a four-time higher probability of developing CHE compared to the higher-income (T20) group. Unlike the B40 group, the M40 group has less access to financial incentives provided by the government.

Furthermore, the respondents from outside the KV

reported twice the likelihood of experiencing CHE as compared to respondents who stayed in KV. Living further away from the hospitals could incur more travelling costs. This is in line with Arsenault et al., (2013), Masiye et al., (2016) and Njagi et al., (2018) studies that highlighted the significance of distance in increasing healthcare costs, subsequently causing CHE. In other words, CHE is commonly higher among the respondents living in rural areas due to the low income and education levels. For instance, van Minh and Xuan, (2012) and Yang et al., (2016) reported a higher CHE among respondents from rural areas.

In contrast, Gotsadze et al., (2009) and Laokri et al., (2014) reported a higher CHE among urban households. Additionally, the majority of the respondents had medium-sized households. A high CHE was detected in the smaller-sized households, which affirmed the results of Adissa, (2015) study. However, it was in contrast with the findings of Shi et al., (2011) and Dyer et al., (2013) studies in which a high CHE was detected among large-sized households. A possible explanation is that a small household not only commands a smaller income but often has a higher health expenditure, thus leading to a higher risk of CHE.

When comparing patients with different cancer duration, we found a higher level of CHE among patients with shorter cancer duration, not echoing the findings of Choi et al., (2014) whereby a higher CHE was reported among Korean patients after the second year of cancer onset. A possible explanation is that most of the more costly active treatments are usually administered in the earlier stage of the disease after diagnosis. Often, most of the patients would have depleted their financing mechanisms by the beginning of the second year, thus further increasing the risk of CHE. In a local study, Sharifa Ezat et al., (2017) stated that most Malaysians were in a state of complacency about healthcare expenditure as they were entitled to free or highly subsidized health services in the public healthcare sector. Therefore, they might be caught unprepared to pay for their treatments.

More respondents received chemotherapy for almost all types of cancer, except for head and neck cancers, whereby the majority of the respondents underwent radiotherapy. Rothenberg et al., (2020) reported that there have been several advancements in cancer treatment in the past 25 years. Initially, there were only a handful of chemotherapy and hormonal drugs. In recent times, several new-generation drugs have been marketed, including drugs that can target cancer cells accurately. However, this has also led to an increase in drug expenditure for cancer treatment.

In terms of cancer treatment, our findings showed patients receiving chemotherapy and combination chemo-radiotherapy were both four times more likely of developing CHE, whereas those on radiotherapy had three times higher risk of CHE. Kavosi et al., (2014) also reported a higher CHE among cancer patients undergoing radiotherapy. In Malaysian public hospitals, patients pay RM 12 (US$ 2.87) for each fraction (dose) of radiotherapy. The number of radiotherapy fractions given varies depending on the type of cancer and whether the treatment is for adjuvant, neoadjuvant, or palliative purposes. A minimum of 35 fractions is usually needed to complete a radiotherapy treatment, giving rise to a total cost of at least RM 420 (US$ 88.81).

If the patient needs a combination of chemo-radiotherapy treatment, then the cost will be much higher. Furthermore, since almost all radiotherapy centers in the central region of Malaysia are located in the KV, patients from outside the KV area would be predisposed to even higher risk of CHE due to the higher indirect healthcare costs such as transportation, food, and accommodation incurred when travelling to the radiotherapy centers in the KV.

Next, the frequency of treatment also affected the CHE prevalence. Similar to Mingjie et al., (2020) study, our study also reported that patients with frequent hospital visits were more likely to suffer from a greater economic burden from OOP payments and succumb to CHE. Repeated hospitalizations require households to fork out more indirect non-medical expenditures such as transportation and accommodation, subsequently leading to a higher financial cost and economic burden for the households.

On the other hand, our study found that more than one-third (36.5%) of the respondents had some form of health insurance coverage, which was higher than the national level of 19.7% reported in HIES (2019). However, those with health insurance were four times more likely to develop CHE than the group without health insurance. This is consistent with Barros and Bertoldi, (2008) and Kavosi et al., (2014) studies in which CHE was found to be higher among cancer patients with health insurance. Most of the health insurance available in Malaysia is private health insurance that requires monthly or yearly premium payments. Such insurance schemes can exert a financial burden on a household's health expenditure.

Furthermore, the benefit package of private health insurance might not provide adequate coverage for cancer treatment costs. Such limited coverage could result in the patients turning to public healthcare facilities once they have exhausted their insurance coverage in the private healthcare facilities. Our study also revealed that 39.8% of the respondents possessed a GL, higher than the 22.5% reported in HIES (2019). Lack of GL and access to health financial aid were both significant predictors of CHE whereby the probabilities of developing CHE were almost three times higher in these groups compared to their counterparts.

This study revealed a high CHE level among cancer patients in Malaysia, in line with studies from other countries. Various risk factors of CHE among cancer patients were also identified in the study. Significant predictors of CHE can ensure that the right support is channeled to cancer patients to reduce the burden of CHE. In addition, the outcomes of the study can guide policy makers in the preparation of healthcare budget allocation and the establishment of the national social health insurance scheme.

Author Contribution Statement

All authors contributed equally in this study.

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