Path Analysis on the Biopsychosocial Factors Affecting the Quality of Life in Patients with Breast Cancer

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ABSTRACT

Background: Breast cancer is the most common cancer among women, affecting 2.1 million women every year. Assessment of quality of life is considered the most important and strong indicator for breast cancer outcomes. The purpose of this study was to analyze biopsychosocial factors that affect the quality of life of breast cancer patients.

Subjects and Method: A cross-sectional study was conducted in the breast cancer community in Surakarta, Central Java from December 2019 to January 2020. A sample of 200 breast cancer patients was selected by simple random sampling. The dependent variable was the quality of life of breast cancer patients. The independent variables were stadium, chemotherapy, length of diagnosis, age, depression, coping strategies, social networks, level of knowledge, education level, income level, employment status, and marital status. Quality of life was measured by WHO-QOL-BREF. Other data were collected by questionnaire. Data were analyzed by path analysis using the Stata 13 application.

Results: The quality of life of breast cancer patients was directly increased by high family income (b= 3.27; 95% CI= 1.67 to 4.87; p<0.001), strong social network (b= 2.61; 95%CI= 0.96 to 4.26; p= 0.002), length of diagnosis ≥24 months (b= 2.68; 95% CI= 0.98 to 4.39; p= 0.002), good coping strategy (b= 1.65; 95% CI= 0.12 to 3.19;

p= 0.034), and finished chemotherapy (b=1.32; 95% CI = -0. 22 to 2.87; p= 0.093). The quality of life of breast cancer patients was directly decreased by depression (b= -2.78; 95% CI=-4.41 to -1.15; p= 0.001) and advanced stage (b=-2.43; 95% CI= -4.04 to 0.83; p= 0.003). Quality of life was indirectly affected by coping strategy, marital status, chemotherapy, knowledge, length of diagnosis, age, employment, and education.

Conclusion: The quality of life of breast cancer patients is directly increased by high family income, strong social network, length of diagnosis ≥24 months, good coping strategy, and finished chemotherapy. The quality of life of breast cancer patients is directly decreased by depression and advanced stage. Quality of life is indirectly affected by coping strategy, marital status, chemotherapy, knowledge, length of diagnosis, age, employment, and education.

Keywords: quality of life, breast cancer, path analysis

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BACKGROUND

Breast cancer is the most common cancer among women, affecting 2.1 million women every year and the biggest cause of cancer-related death among women. In 2018, an estimated 627,000 women died of breast cancer, which is about 15% of all cancer deaths among women. Breast cancer is a type

of cancer with the highest percentage of cases that is equal to 42.1% after that is cervical cancer (23.4%), lung cancer (12.4%), colon cancer (12.1%), ovarian cancer (9.7%). Breast cancer is the highest cause of death among other cancers which is 17.0%, after that there is cervical cancer (13.9%), lung cancer (10.-9%), liver cancer (7.5%), and colon cancer (6.9%) (WHO, 2018).

Basic Health Research Data (RISKES-DAS) in 2018, found the prevalence of sufferers in 2018, obtained the prevalence of cancer patients in the population of all ages in Indonesia by 1.79% increased compared with the prevalence of cancer patients in 20-13 which was 1.4%. The highest cancer prevalence in 2018 is in the Province of Yogyakarta, which is 4.86%, far higher than the national rate (1.8%). The next highest prevalence was in West Sumatra Province (2.47%), Gorontalo (2.44%), DKI Jakarta (2.33%), Bali (2.27%), Central Sulawesi (2.23%), East Java (2.17%), North Kalimantan (2.16%) %), South Kalimantan (2.13%), and Central Java (2.-11%). Central Java Province is included in the top 10 highest prevalence of breast cancer in Indonesia.

Breast cancer patients in the first year after diagnosis will experience depression. Patients will experience psychological disorders such as anxiety disorders, anger, low self-esteem, and low emotional support (Rios and Pedaza, 2018).

The population of women who have survived breast cancer over the past 5 years is increasing and growing. Care and rehabilitation are increasingly important to support the recovery of breast cancer patients. The quality of life for breast cancer patients in the long term will improve after chemotherapy and or radiotherapy treatment compared with patients who have not or who are currently undergoing of chemotherapy (Schmidt, 2018). The socioeconomic situation in general is related to various health problems.

A good social economy will affect someone's awareness, willingness and ability to improve their health (Lusiatun, 2016).

Unmarried breast cancer patients are associated with poor quality of life and support the idea that strong family relationships, close communication with partners, have a significant effect on improving the quality of life of breast cancer patients (Farha et al., 20-17). Social networking is a process of observing social structures in socializing that are interconnected between them. Breast cancer patients who have a weak social network will reduce the quality of life of these patients (Graells-Sans,2018).

Lovely Pink Solo is a breast cancer community in Surakarta. The goal of the Lovely Pink Solo community is as a forum to exchange information about breast cancer, share experiences about medicine, provide mutual support, think positively and strengthen breast cancer patients so that their confidence returns. From the background described, the researchers will conduct a study to analyze various biopsychosocial and economic factors that affect the quality of life of breast cancer patients in Surakarta.

SUBJECTS AND METHOD

1. Study Design
This was an analytic observational study with a cross sectional design. The study was conducted at the Lovely Pink Solo breast cancer community, in Surakarta, Central Java, from December 2019 to January 2020.

2. Population dan Sample
The population in this study consisted of breast cancer patients in the Lovely Pink Solo community. A sample of 200 patients was selected by simple random sampling.

3. Study Variables
The dependent variable was the quality of life. The independent variables were cancer stage, chemotherapy, duration of diagnosis, age, depression, coping strategies, social net-

works, level of knowledge, level of education, level of income, and employment status.

4. Operational Definition of Variables

Quality of life is an assessment of study subjects about her well-being which includes physical, psychological, social, and environmental health resulting from breast cancer. The instruments used are WHOQOL-BREF. The measurement scale was continous, but it was transformed into dichotomous, coded 0= poor and 1= good.

Cancer stage is the stage of cancer development based on the spread of cancer in the body when diagnosed. Data were collected using a questionnaire. The measurement scale was continous, but it was transformed into dichotomous.

Chemotherapy was a cancer treatment with various risks. Data is collected by using a questionnaire. The measurement scale was categorical, 0= have not conduct chemotherapy or during chemotherapy and 1= after chemotherapy.

Marital status was a marriage bond that has been ratified by the KUA (Office of Religious Affairs). Data is collected using a questionnaire. The measurement scale was categorical, code 0= not married/divorced and 1= married.

Social network was a study subject statement about how often the subject interacts with family, relatives and the community. Data was collected by questionnaire. The measurement scale was continous, but it was transformed into dichotomous, code 0= weak and 1= strong.

Length of diagnosis is the time from the study subject diagnosed with breast cancer to date within months. Data were collected by questionnaire. The measurement scale was continous, but it was transformed into dichotomous, code 0<24 months and 1= ≥24 months.

Age was the age of the subject at the time of the study in years. Data were collected using a questionnaire. The measurement scale was continous, but it was transformed into dichotomous, coded 0= <45 years old and 1= ≥45 years old.

Coping strategy was an expression of the subject on the thoughts and attitudes carried out in dealing with breast cancer they experience. The instruments used are BREF-COPE. The measurement scale was continous, but it was transformed into dichotomous, coded 0= weak and 1= strong.

Depression was a condition that makes a mood become prolonged disturbed and arises due to loss of hope or feelings of helplessness. Data were collected using the DASS questionnaire. The measurement scale was continous, but it was transformed into dichotomous, code 0= not depressed and 1= depressed.

Level of knowledge was a statement from the subject of study on knowledge about breast cancer. Data were collected using a questionnaire. The measurement scale was continous, but it was transformed into dichotomous, coded 0= low and 1= high.

Level of education was the last formal education taken by subjects and have a certificate. Data were collected using a questionnaire. The measurement scale was categorical, coded 0= <Senior high school and 1= ≥Senior high school.

Family income was the average monthly family income each month in the last 6 months. Data was collected by using questionnaire. The measurement scale was continous, but it was transformed into dichotomous, code 0= <5.6 million and 1= ≥5.6 million.

Employment status is a statement of subjects about the status of employment at the time of study. Data were collected using a questionnaire. The measurement scale was categorical, coded 0= not working or working at the house and 1= working outside the home.

5. Data Analysis
a. Univariate Analysis
Univariate analysis was performed on each study variable. Categorical data were described in the frequency distribution table. Characteristics of continuous data samples were described in the n parameters, mean, SD, minimum and maximum.

b. Bivariate Analysis
Bivariate analysis in this study used the Pearson product moment test. This test is to find out the relationship between X and Y variables.

c. Multivariate Analysis
Multivariate analysis is to determine the effect of various variables studied using Path Analysis by using the Stata 13 application.

6. Research Ethics
This study was conducted based on study ethics, namely informed consent, anonymity, confidentiality, and ethical study. The study ethics was obtained from the Health Research Ethics Committee at Dr. Moewardi Hospital, Surakarta, Indonesia, No. 1.335 /-XII/HREC/2019.

RESULTS
1. Sample Characteristics
Table 1 shows sample characteristics (continous data). Categorical data are explained in Table 2. Table 2 shows the age of the sample is mostly ≥40 years old (92.5%), working at hoe (49%), and had education ≥Ssenior high school (80%).

Table 1. Sample Characteristics (continuous data)

Variable	n	Mean	SD	Min.	Max.
Quality of life	200	304.03	49.65	211	381
Coping strategy	200	50	3.82	39	56
Knowledge	200	8.91	1.43	5	12
Depression	200	2.39	1.49	1	9
Social network	200	14.10	1.50	9	16

Table 2. Sample characteristics (categorical data)

Characteristics	Category	n	%
Age	<40 years old	15	7.5
	≥40 years old	185	92.5
Education	<Senior high school	40	20
	≥ Senior high school	160	80
Employment	Not working/Working at home	98	49
	Farmers	1	0.5
	Entrepreneur	9	4.5
	General Employee	35	17.5
	Civil Servant	38	19
	And others	19	9.5
Income	Low	91	45.5
	High	109	54.5
Marital status	Not married	9	4.5
	Widowed/divorced	73	36.5
	Married	118	59
Length of diagnosis	<24 months	115	57.5
	≥24 months	85	42.5
Stage	Early	119	59.5
	Advanced	81	40.5
Chemotherapy	Have not/1-3 times	6	3
	>3 times	46	23
	Finished chemotherapy	148	74

Maternal level of education which is above HS is 160 people (80%). Mothers who mostly work in the home are 98 people (49%). High level of family income was 54.5%. Most of the subjects are married by 118 people (59%). The length of diagnosis of subjects was less than 24 months (57.5%). The initial stage of the sample is 119 people (59.5%). Most of the samples had finished doing chemotherapy (74%).

2. The result of bivariate analysis

Table 3 shows that the results of a bivariate analysis on biopsychosocial and economic factors that affect the quality of life of breast cancer patients.

Table 3 shows that family income (r= 0.61; p <0.001), length of diagnosis (r= 0.46; p <0.001), coping strategies (r= 0.52; p <0.001), knowledge (r= 0.34; p<0.001), and social networks (r= 0.55; p<0.001) improve the quality of life of breast cancer patients. Table 3 shows that depression decreases the quality of life of breast cancer patients (r= -0.65; p<0.001).

Table 3. Bivariate correlations between income, duration of diagnosis, coping strategies, knowledge, depression, social networks, and the quality of life of breast cancer patients

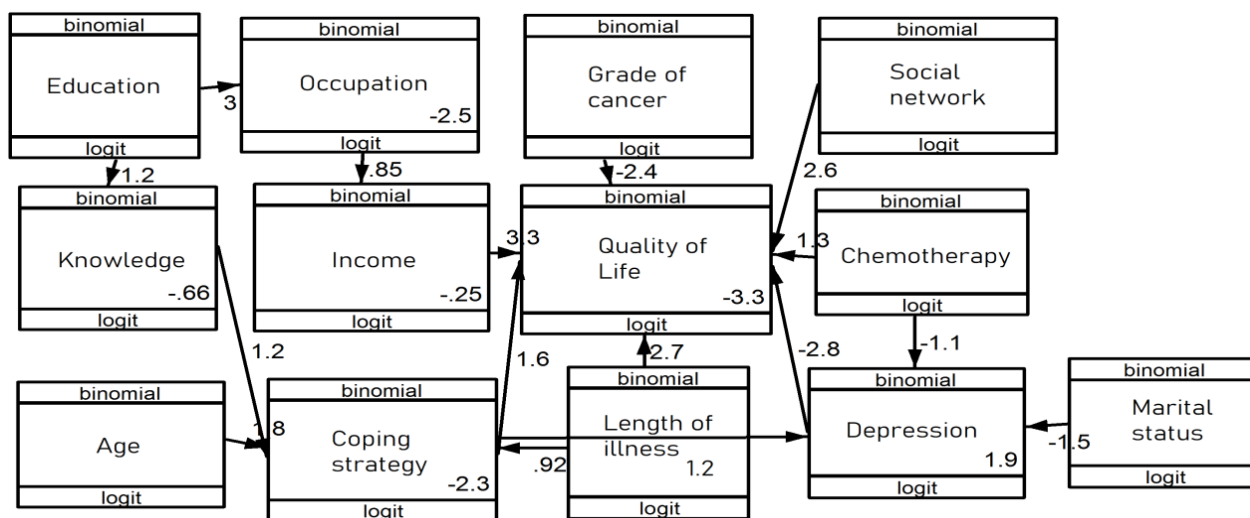| Independent Variables	r	p
Income	0.61	<0.001
Length of diagnosis	0.46	<0.001
Coping strategy	0.52	<0.001
Knowledge	0.34	<0.001
Depression	-0.65	<0.001
Social networking	0.55	<0.001

Figure 1. Structural Model of Path Analysis

3. Path analysis

Figure 1 depicted structural model of path analysis. Table 4 showed psychosocial and economic factors that affect the quality of life of breast cancer patients. Table 4 showed that there was a direct effect on family income, depression, social networks, duration of diagnosis, stage, coping strategies and chemotherapy from the quality of life of breast cancer patients.

Table 4 showed that the quality of life of breast cancer patients is directly affected by

high family income ≥5.6 million (b= 3.27; 95% CI= 1.67 to 4.87; p<0.001), strong social network (b= 2.61; 95% CI= 0.96 to 4.26; p= 0.002), length of diagnosis ≥24 months (b= 2.68; 95% CI= 0.98 to 4.39; p= 0.002), strong coping strategy (b= 1.65; 95% CI= 0.12 to 3.19; p= 0.034), and finished chemotherapy (b= 1.32; 95% CI = -0.22 to 2.87; p= 0.093).

Table 4 shows that depression directly reduced the quality of life of breast cancer patients (b= -2.78; 95% CI= -4.41 to - 1.15; p<0.001). Figure 1 shows that the quality of life of breast cancer patients is indirectly affected by coping strategies, marital status, chemotherapy, knowledge, length of diagnosis, age, employment and education.

Table 4. Psychosocial and economic factors that affect the quality of life of breast cancer patients

Dependent Variable	Independent Variable	Path Coef. (b)	95% CI Lower Limit	95% CI Upper Limit	p
Direct effect					
Quality of life (good)	← Income (≥Rp.5.6 million)	3.27	1.67	4.87	<0.001
	← Depression	-2.78	-4.41	-1.15	0.001
	← Social network (strong)	2.61	0.96	4.26	0.002
	← Length of diagnosis (≥24months)	2.68	0.98	4.39	0.002
	← Stage (advanced)	-2.43	-4.04	-0.83	0.003
	← Coping strategy(good)	1.65	0.12	3.19	0.034
	← Chemotherapy (finished)	1.32	-0.22	2.87	0.093
Indirect effect					
Depression	← Coping strategy(good)	-1.25	-1.92	-0.58	<0.001
	← Married	-1.54	2.21	-0.87	<0.001
	← Chemotherapy (finished)	-1.13	-1.81	-0.32	0.005
Coping strategy (good)	← Knowledge (good)	1.18	0.56	1.89	<0.001
	← Length of diagnosis (≥24 months)	0.92	0.28	1.56	0.005
	← Age (≥40 years old)	1.79	0.43	3.15	0.010
Income (≥ Rp. 5.6 million)	← Employment (outside the home)	0.85	0.28	1.42	0.003
Employment (outside the home)	← Education (≥Senior high school)	3.03	1.82	4.26	<0.001
Knowledge (good)	← Education (≥Senior high school)	1.21	0.49	1.93	0.001

n observation=200
AIC= 1301.21
BIC= 1373.77

DISCUSSION

1. The effect of income on the quality of life

The results of this study showed that breast cancer patients with family income ≥5.6 million have the possibility to have a good quality of life by 3.27 times than family income <5.6 million (b= 3.27; CI 95%= -1.67 to 4.87; p<0.001).

The results of this study were in line with Alshreef et al. (2019) which stated that income has a significant influence on the quality of life of breast cancer patients.

Cancer treatment costs are related to the burden of quality of life for breast cancer patients. The financial pressure is related to the medical care costs of breast cancer patients. In addition, financial tension also influences bad emotional changes for breast

cancer patients (Perry et al., 2019). Emotional changes in breast cancer patients on low incomes would lead to stress and can cause depression (Patel et al., 2018).

2. The effect of depression on quality of life

This study showed that breast cancer patients with depression would reduce the quality of life than non-depressed (b= -2.78; 95% CI= -4.41 to -1.15; p<0.001). This study was in line with Kugbey et al. (2019), which stated that breast cancer patients with high depression would reduce quality of life. This explained that breast cancer patients with low depression would improve the quality of life of breast cancer patients.

Depression is the number one factor that affect the functional status of breast cancer patients. The presence of depressive symptoms in people with breast cancer negatively affected their well-being, social role, emotional status, and decreased their quality of life (Calderon et al., 2019). If depression in breast cancer patients is not managed properly, then it might be an obstacle for breast cancer patients to return to their previous state (Muhit and Siyoto, 2016). The depression experienced by breast cancer patients changes with time. After that breast cancer patients will recover from depression and can continue to live for further medical treatment in order to improve their quality of life (Kim et al., 2018).

3. The effect of soxial network on quality of life

The results showed that there was a relationship between social networks and quality of life. Breast cancer patients with strong social networks were 2.61 times more likely to have a good quality of life than weak social networks (b = 2.61; 95% CI = 0.96 to 4.26; p= 0.002). This study explained that breast cancer patients with strong social networks would improve the quality of life of breast cancer patients. In addition, a strong social network would foster various social support among members of breast cancer patients.

Social networks can encourage breast cancer patient participation in healthy behavior and health care. Social networks can also provide various types of social support (Gunn et al., 2017). Other study also supported that strong social networks are shown to have better breast cancer survival and are associated with lower mortality. Breast cancer patients who have strong social networks tend to have greater physical activity and a lower prevalence of smoking, obesity and alcohol consumption (Kroenke, 2018).

The results showed that there was a relationship between the length of diagnosis and quality of life. Breast cancer patients with a diagnosis duration of ≥24 months had the possibility for good quality of life by 2.68 times greater than the length of diagnosis <24 months (b = 2.68; 95% CI = 0.98 to 4.39; p = 0.002). The duration of diagonosis can be related to depression in breast cancer patients. Early breast cancer patients were diagnosed with breast cancer as having a worse quality of life than breast cancer patients after two years of diagnosis.

The diagnosis of breast cancer can create psychological problems for survivors, family and relatives. In addition, the acceptance phase of getting cancer is different for everyone. Starting from the diagnosis, the treatment phase and the initial recovery period (Michaelides and Constantinou, 2020)

4. The effect of stage on quality of life

The results showed that there was a relationship between stage and quality of life. Patients with advanced stage breast cancer have the possibility to reduce their quality of life by 2.43 times greater compared to the initial/early stage (b=-2.43; 95% CI=-4.04 to -0.83; p= 0.003). This study was in line with Jeffe et al. (2015), which stated that early-stage cancer has a relatively high quality of life and improved compared to advanced

stage. This is mainly due to early detection with increased breast cancer screening and improved cancer treatments that are already very good. However, it still need regular maintenance to avoid recurrence.

The introduction of breast cancer is important to reduce new cases. Prevention and early detection would become easier when risk factors and cancer symptoms are identified. Cancer cases found at an early stage have received fast and appropriate treatment and would provide a longer life expectancy. So it is important to conduct checks regularly in efforts to prevent and detect cancer early (Ministry of Health Republic of Indonesia, 2016).

5. The effect of coping strategy on quality of life

The results showed that there was a relationship between coping strategies and quality of life. Breast cancer patients with good coping strategies have the possibility for a good quality of life by 1.65 times greater than the poor coping strategies (b= 1.65; 95% CI= 0.12 to 3.19; p= 0.034).

Coping strategies are cognitive attempts and intentional behaviors to manage or reduce emotionally threatening situations and stress in life. The strategies used in coping include accepting situations and playing an active role, eliminating stressors or moving away from stressors, releasing feelings connected to stressors and see stressors as something positive on growth (Blum *et al.*, 2012).

Patients with breast cancer faces a fear of death and the financial burden of care. There is also loss of self confidence, insecurity, instability and sadness when people make unconscious and deliberate comments to the women with breast cancer. Such cases require coping strategies (Iddrisu et al., 2019).

Various coping strategies are carried out by listening to music and engaging in various hobbies, attention and mediation can be effective in reducing pressure and increasing welfare among women with breast cancer. Positive thinking, willingness to fight disease and having hope are reported as important coping strategies among women with breast cancer (Drageset *et al.*, 2016).

6. The effect of chemotherapy on quality of life

The results showed that there was a relationship between chemotherapy and quality of life. Breast cancer patients with chemotherapy treatments that have been completed have the possibility to improve the quality of life by 1.32 times greater than those who still conduct the chemotherapy (b= 1.32; 95% CI= -0.22 to 2.87; p= 0.093). The results showed that quality of life improved in one year after chemotherapy treatment was given (Kwiatkowski et al., 2013).

Long-term breast cancer patients according to longitudinal studies stated that older breast cancer patients can maintain good emotional and cognitive function. This study showed that personality and social resources influenced the long term emotional welfare of breast cancer sufferers (Durá-Ferrandis *et al.*, 2017).

Other study stated that after chemotherapy, participating in a routine exercise program such as sports or yoga for breast cancer can maintain physical exercise and have long-term effects both for the individual and social benefits (Mijwel *et al.,* 2019).

7. Indirect effect on the quality of life
a. The effects of coping strategies on depression

The results of this study indicated that there was an indirect effect of a good coping strategy on the quality of life of breast cancer patients through depression. This was in accordance with Geyikci et al. (2018), which found that there was a negative relationship between depression and coping strategies in breast cancer women. Breast cancer patients

can face depression with good coping strategies.

b. The effects of marriage on depression

The results showed that there was an indirect effect of marital status on the quality of life of breast cancer patients through depression. Married breast cancer patients showed that in the first 5 years of diagnosis of breast cancer, married women have significantly higher optimism than unmarried women. This is because women who have a partner have a good quality of life so that it would be easier to deal with depression which would produce a good coping strategy for further medical treatment (Croft et al., 2014).

Being single or not having a partner is associated with a higher level of depression compared to being married (Wittenberg, 2010). The results showed that partner support in dealing with breast cancer was the most important source of support compared to other social supports (Salakari et al., 2017).

c. The effects of chemotherapy on depression

The results showed that there was an indirect effect of finished chemotherapy on the quality of life of breast cancer patients through depression. Breast cancer patients who have not or are currently undergoing chemotherapy treatment would experience symptoms of depression related to pain and chemotherapy side effects. This would reduce their welfare, social role, emotional status, and decrease their quality of life. Untreated depression interferes with personal relationship, sexual and temporary rehabilitation can reduce patients' ability to cope with the disease and their quality of life (Calderon, 2019).

d. The effects of knowledge on coping strategies

The results showed that there was an indirect effect of the level of knowledge on the quality of life of breast cancer patients through coping strategies. Cancer patients stated that knowledge and understanding of breast cancer would improve their quality of life.

Women's knowledge and understanding of breast cancer are a source of hope and empowerment for participants based on studies during the diagnosis and management of diagnosis care. The authors discussed the importance of breast screening and mammograms that have been recommended by governments in the United States. According to American women, their knowledge and understanding of breast cancer helps them to identify changes in their breasts and look for early paramedics. Coping strategies to overcome the effects of treatment by keeping their minds from their diseases and always having positive thoughts (Williams and Jeanetta, 2015).

e. The effects of length of diagnosis on coping strategies

The results showed that there was an indirect effect of the length of diagnosis on the quality of life of breast cancer patients through coping strategies.

Some of the copingstrategiesare social support and religious approaches (Kahana et al., 2016). The results of a qualitative study from Devi and Fong (2019) stated that breast cancer patients in Singapore after being diagnosed with breast cancer are getting closer to God, often going to church with the aim of praying for healing the disease, reading the scriptures, using artifacts to ask healing to god.

f. The effects of age on coping strategies

The results showed that there was an indirect effect of age ≥45 years on the quality of life of breast cancer patients through coping strategies.

The result of this study was in line with You et al. (2017), which stated that there was an indirect effect between age and quality of life. Psychological adjustments to cancer

occur in the process of development in dealing with cancer. Many age differences are observed in cancer and psychological experiences that underlie the process. Even though older adults may have cancer and more cancer than young women, but young women have worse emotional stress than older women when diagnosed with cancer. This is related to symptoms of depression and anxiety, quality of life after treatment and fertility.

g. The effects of employment on coping income

The results showed that there was an indirect effect of working outside the home on the quality of life of breast cancer patients through income.

Work and quality of life are affected by financial problems. After being diagnosed with breast cancer, a breast cancer survivor would feel worried about her work because after being diagnosed with breast cancer, the patient would conduct medical treatment so that activity must also be limited so that it can cause a decrease in quality of life (Sleight, 2017). Breast cancer patients who were not working would have a financial burden on the family and would increase depression in patients (Sharp *et al.,* 2015).

h. The effects of education on employment

The results showed that there was an indirect effect of the level of education on the quality of life of breast cancer patients through employment, a low level of education of patients and not working or working at home would have a low effect of knowledge in seeking information. Lack of knowledge about disease management and their awareness in controlling risk factors that can cause disease to be worse and eventually lead to depression (Ogoncho et al., 2016).

i. The effects ofeducation on coping knowledge

The results showed that there was an indirect effect of the level of education on the quality

of life of breast cancer patients through knowledge.

Education of a breast cancer patient can improve the quality of life of breast cancer patients. Patients with higher education have a greater chance of knowing their disease. While low education is a predictor of psychological comorbidity in breast cancer patients (Srivastava et al, 2016).

Higher education would affect someone's knowledge. Higher education would affect someone's mindset in overcoming problems, so that disease management can be done immediately from an early age (Nuryati, 2018).

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