Factors Predicting Infection Prevention Behaviors among Caregivers of Children with Cancer Undergoing Chemotherapy*

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Abstract

Purpose: The objective of this study was to assess the predictive power of health literacy, family support, and home environment on the infection prevention behaviors of caregivers of children with cancer undergoing chemotherapy.

Design: Predictive correlational research.

Methods: The study consisted of 80 caregivers of children with cancer, aged 1-15 years, all types of cancer at every state of treatment, who were followed up both inpatient and outpatient units at two tertiary hospitals in Bangkok. Convenience sampling was used to select the caregivers being the primary caregivers of the children while at home, aged 18-59 years, and able to communicate Thai language. Data were collected by using 5 questionnaires including 1) Demographic Data Questionnaire, 2) The Infection Prevention Behaviors Questionnaire, 3) The Health Literacy Questionnaire, 4) The Family Support Questionnaire, and 5) The Home Environment Questionnaire. The data were analyzed using descriptive statistics and stepwise multiple regression.

Main findings: The results revealed that overall prevention infection behaviors were high ($\overline{X}$ = 116, SD = 11.69). The mean score of health literacy ($\overline{X}$ = 91.95, SD = 7.02) family support ($\overline{X}$ = 66.18, SD = 9.08) and home environment ($\overline{X}$ = 140.4, SD = 1.36) were also high. Health literacy was the only factor that could predict infection preventive behaviors ($\beta = 0.30$, $t = 2.77$, $p < .01$).

Conclusion and recommendations: The caregivers' infection prevention behaviors were influenced by their level of health literacy. Consequently, it is imperative for nurses and healthcare professionals to thoroughly assess the health literacy of caregivers. Then provide support by implementing interventions designed to enhance health literacy in order to improve understanding and application of infection prevention knowledge. These interventions should provide additional channels to access to knowledge, including the preparation of fruits and vegetables, as well as oral assessment and oral hygiene to prevent infections in children with cancer undergoing chemotherapy.

Keywords: children with cancer, family support, health literacy, home environment, infection prevention behaviors

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ปัจจัยทำนายพฤติกรรมการป้องกันการติดเชื้อของผู้ดูแลผู้ป่วยเด็กโรคมะเร็งที่ได้รับยาเคมีบำบัด*

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บทคัดย่อ

วัตถุประสงค์: การวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาอำนาจการทำนายของความรอบรู้ด้านสุขภาพ การสนับสนุนของครอบครัว สภาพสิ่งแวดล้อมของบ้าน ต่อพฤติกรรมการป้องกันการติดเชื้อของผู้ดูแลผู้ป่วยเด็กโรคมะเร็งที่ได้รับยาเคมีบำบัด

รูปแบบการวิจัย: ความสัมพันธ์เชิงทำนาย

วิธีดำเนินการวิจัย: กลุ่มตัวอย่างเป็นผู้ดูแลผู้ป่วยเด็กอายุ 1-15 ปี โรคมะเร็งทุกชนิด ที่ได้รับการรักษาด้วยยาเคมีบำบัดทุกระยะ มาตรวจรักษาที่โรงพยาบาลตติยภูมิ 2 แห่งในกรุงเทพมหานคร ที่เข้ารับบริการทั้งผู้ป่วยในและผู้ป่วยนอก จำนวน 80 ราย เลือกตัวอย่างแบบสะดวกด้วยเกณฑ์ต้องเป็นผู้ดูแลหลักของผู้ป่วยเด็กขณะอยู่ที่บ้าน อายุ 18-59 ปี และสื่อสารภาษาไทยได้ เก็บข้อมูลโดยใช้แบบประเมิน 5 ชุด ได้แก่ ข้อมูลส่วนบุคคล พฤติกรรมการป้องกันการติดเชื้อ ความรอบรู้ด้านสุขภาพ การสนับสนุนของครอบครัว และสิ่งแวดล้อมของบ้าน วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนา และสัมประสิทธิ์ถดถอยพหุคูณแบบขั้นตอน

ผลการวิจัย: ผลการศึกษาพบว่า ผู้ดูแลผู้ป่วยเด็กโรคมะเร็งมีคะแนนเฉลี่ยพฤติกรรมการป้องกันการติดเชื้อโดยรวมสูง ($\overline{X}$ = 116, SD = 11.69) ความรอบรู้ด้านสุขภาพ ($\overline{X}$ = 91.95, SD = 7.02) การสนับสนุนของครอบครัว ($\overline{X}$ = 66.18, SD = 9.08) และสิ่งแวดล้อมของบ้าน ($\overline{X}$= 14.04, SD = 1.36) อยู่ในระดับสูง ความรอบรู้ด้านสุขภาพเป็นตัวแปรเดียวที่สามารถทำนายพฤติกรรมการป้องกันการติดเชื้อได้อย่างมีนัยสำคัญทางสถิติ (β = .30, t = 2.77, p < .01)

สรุปและข้อเสนอแนะ: ความรอบรู้ด้านสุขภาพมีอิทธิพลต่อพฤติกรรมการป้องกันการติดเชื้อของผู้ดูแล ดังนั้นจึงมีความจำเป็นอย่างยิ่งที่พยาบาลและบุคลากรสุขภาพ ควรประเมินความรอบรู้ด้านสุขภาพของผู้ดูแล และจัดโปรแกรมเสริมสร้างความรอบรู้ด้านสุขภาพ เพื่อส่งเสริมให้ผู้ดูแลมีความเข้าใจข้อมูลความรู้อย่างลึกซึ้ง สามารถนำความรู้ไปปฏิบัติดูแลผู้ป่วยเด็กได้ เพิ่มช่องทางการเข้าถึงความรู้ โดยเฉพาะเรื่องการเตรียมผักและผลไม้ การประเมินและการดูแลช่องปากเพื่อป้องกันการติดเชื้อสำหรับผู้ป่วยเด็กโรคมะเร็งที่ได้รับยาเคมีบำบัด

คำสำคัญ: เด็กโรคมะเร็ง การสนับสนุนของครอบครัว ความรอบรู้ด้านสุขภาพ สิ่งแวดล้อมของบ้าน พฤติกรรมการป้องกันการติดเชื้อ

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Background and Significance

Childhood cancer is a significant public health concern and one of the primary causes of death in children worldwide.[1-2] Approximately 400,000 children and adolescents were diagnosed with cancer each year, making it the primary cause of mortality among children with chronic illnesses. In Thailand, there were around 94 new cases of cancer diagnosed per 100,000 children aged 1-15 years old. The incidence of cancer in this age group increased by 1.2% each year.[3] Currently, chemotherapy (CMT) is a highly significant treatment for cancer with targeted drugs broadly accessible, which has been associated to an overall increase in the survival rate for children with cancer.[4-5] However, it can lead to numerous adverse effects, particularly bone marrow suppression, characterized by diminished hematopoiesis, compromised immunological response, and susceptibility to infection. Previous microbiological research has demonstrated that over 50% of children who underwent CMT experienced an infection caused by bacteria, viruses, or fungi. These infections typically originated from unsanitary environments, inadequately ventilated areas, contaminated food, or inadequate oral hygiene.[6-8] These infections can lead to severe illnesses that impact numerous organs and increase the death rate in children with cancer.[9-10] Consequently, children undergoing chemotherapy are susceptible to infection as a result of the adverse effects of CMT.

The triangle model for infectious disease, a classical model of infectious disease causation, explains the underlying interaction between the disease-causing agent, the susceptible individual, and their environment. The model describes the dynamics of infectious agents, which can be transmitted either through direct host-to-host contact or indirectly through the transfer of germs (agents). Any alteration in the balance of factors can cause infection. Agent imbalance refers to a situation where a potent agent can disseminate and infect the host, as seen in cases such as H1N1 influenza. The body cannot effectively combat the pathogen if the host aspect is unbalanced or susceptible, such as in individuals undergoing CMT.

Moreover, there is an environmental imbalance, changes in climate and environment, and the presence of many agents that can cause respiratory infections, such as mold, tuberculosis, measles, chickenpox, and influenza. Increased humidity in the home environment, for example, might contribute to the proliferation of these disease-causing agents. Therefore, it is crucial to prevent infection by maintaining balance among the three components of the triangle and their interactions through the development of appropriate, practical, and efficient approaches.[11]

Caregivers play a crucial role in providing proper care for children with cancer undergoing CMT to minimize the risk of infections. They are primarily responsible for making important decisions regarding the child's CMT treatment while they are at home. To achieve balance in the triangle of 3 components, caregivers must improve the host and environment factors while minimizing the agents in 3 aspects[12-14]: 1) The hygiene aspect includes bathing, handwashing, and assessing and maintaining oral hygiene. This involves conducting regular oral examinations, brushing teeth, and rinsing the mouth with saline solution after each meal. 2) The food aspect involves carefully choosing the food to ensure that children consume freshly prepared meals and drink boiled or sterilized water. The children should avoid raw vegetables and fruits with thin skins that can be eaten whole. Food and vegetables must be prepared hygienically and stored in clean containers. 3) Environmental aspects encompass health promotion and disease prevention measures, such as promoting the administration of flu vaccines among family members, recommending the use of masks, avoiding contact with individuals suffering from respiratory infections, and discouraging the sharing of utensils such as spoons and straws. Additionally, maintaining a clean household environment is also crucial. However, it was discovered that caregivers of children with cancer displayed insufficient infection-prevention behaviors.[12-13]

Health literacy, family support, and home environment were relevant factors in the care of chronically ill and healthy children. Health literacy refers to an individual's capacity to effectively navigate and comprehend the complex health requirements in modern society. This includes their knowledge, motivation, and competencies in accessing, understanding, appraising, and applying health-related information within the contexts of healthcare, disease prevention, and health promotion.[15] There was a positive correlation between health literacy and parental care behaviors for preventing respiratory infections in children with congenital heart disease prior to cardiac surgery.[16-17] However, in the context of children with cancer, only one study has been discovered that demonstrates a positive correlation between health literacy and the caring behaviors of caregivers for preschool children with leukemia.[13] Consequently, it is necessary to conduct additional research on health literacy's potential for predicting infection prevention behavior among caregivers of children with cancer undergoing CMT.

Family support is a significant factor contributing to caring behaviors in children, whether chronically ill or healthy.[13,18-19] According to social support theory by Cobb[20],

social support refers to the information that assures the individuals that they are cared for, loved, valued, and part of a network of mutual obligations. Family support has a crucial role in the resilience of parents of children with cancer, leading to the offering of more appropriate care. Following the diagnosis of cancer in children, family members are involved in providing support and encouragement to caregivers responsible for the children's care. This included activities such as rehabilitation, maintaining a clean household, ensuring a hygienic environment, and managing sanitation for pediatric patients.[19-20] Furthermore, it was discovered that informational support, an aspect of social support, can account for variations in caregivers' behaviors regarding nutritional care to prevent infection in leukemia children with CMT.[21] On the contrary, a study of Sutus and colleagues[13] found that social support did not have a significant correlation with the caring behaviors of leukemia children undergoing CMT; even though the care givers perceived information support obtained at moderate level, their understanding of the information and advice given may not be sufficient enough to enhance their caring behavior.

Home environments that are related to infection are another factor that had been studied. Home environments comprise both indoor and outdoor settings. There was an association between home environment barriers and infection prevention and control behaviors.[22] An inappropriate environment was a significant contributing factor to the occurrence of infections in children with cancer undergoing CMT treatment.[14] According to international literature, there were incidents of early childhood acute respiratory infections (ARIs) associated with the indoor environment, such as living in a rented dwelling, household crowding, or dampness.[23] A study revealed that young children below the age of 5 who were exposed to various environmental contaminants in Myanmar had a higher likelihood of experiencing acute diarrhea and acute respiratory tract infections.

The PRECEDE model of Green and Kreuter[24] was used in this study to find predictive factors for infection prevention behaviors which can be divided into 3 components 1) Predisposing factors, 2) Reinforcing factors, and 3) Enabling factors. All three factors are different in affecting behavior change and need to work together to create motivation, support the sustainability of appropriate behavior change, so planning to change a person's health behavior must consider the influence of these three factors that affect health behaviors in bringing together actions to promote the desired health behaviors.

Therefore, the researcher's objective was to examine three variables—health literacy (predisposing factor), family support (reinforcing factor), and home environment (enabling factor)—to determine their ability to predict infection prevention behaviors among caregivers of cancer children undergoing CMT. The findings of this study could serve as the basis for healthcare professionals to create programs to improve infection prevention behaviors among caregivers. This would help ensure the safety of children, minimize complications, and facilitate continuous administration of CMT until the treatment course is completed.

Objectives

This study aimed to investigate the predictive power of health literacy, family support, and home environment on infection prevention behaviors among caregivers of children with cancer aged 1-15 years undergoing CMT.

Hypothesis

The health literacy of infection prevention behaviors, family support, and home environment could predict infection prevention behaviors among caregivers of children with cancer aged 1-15 years who were undergoing CMT.

Methodology

This study was predictive correlational research.

Population and Sample

The population consisted of caregivers of children with cancer who were undergoing CMT from both the outpatient and inpatient units of two tertiary care hospitals, namely Siriraj Hospital and Ramathibodi. Participants who fulfilled the eligible criteria were recruited to participate in the study using convenience sampling. The inclusion criteria for the caregivers included the following: 1) Being the primary caregivers of children within the household, including fathers, mothers, or relatives such as aunts or grandmothers; 2) Being between the age range of 18-59 years and 3) Possessing the ability to speak fluently in Thai language. The inclusion criteria for children with cancer were as follows: 1) children between the ages of 1 and 15, diagnosed with any cancer at any stage of treatment, 2) underwent at least one round of CMT treatment, and 3) had been discharged from the hospital for a minimum of one week.

To calculate sample size with the medium effect size of $f^2 = .15$, significance level at .05, and power of .80, the study required a minimum sample size of 80. Based on the proportion of patients receiving treatment from both hospitals, 40 participants were recruited from each hospital.

Research Instruments

A self-administered questionnaire was employed to collect the data. The data-gathering process utilized a questionnaire of 111 items, which was divided into five parts as follows:

1) Demographic Data Questionnaire (included age, marital status, education level, household income, and employment status developed by the researcher.

2) The Infection Prevention Behaviors Questionnaire developed by the researcher based on the literature review[12-14] consists of 46 items included hygiene, food, and environmental aspects with 4-point rating scale ranging from (0) never happened (non-existence), (1) never practice, (2) practice sometimes, (3) frequently practice resulting in a total score range of 0-138 points. If participant answered "(0) never happened", the score will not be counted, but the average score is used. The higher overall scores indicate that the caregiver has more overall infection prevention behaviors.

3) The Health Literacy Questionnaire developed by Sutas, Sanasuttipun and Srichantaranit[13] for assessing health literacy of caregivers of children with leukemia receiving chemotherapy. The questionnaire consists of 34 items in four aspects of health literacy (accessing, understanding, appraising, and applying) with 4-point rating scale ranging from (0) not true at all, (1) slightly true, (2) moderately true, (3) "strongly true" resulting in a total score range of 0-102 points. The higher overall scores indicate that the caregiver has more overall health literacy.

4) The Family Support Questionnaire developed by the researcher based on literature review[18-20] consists of 16 items across five dimensions of family support: emotional, appraisal, social integration, instrumental, and information support. The Family Support Questionnaire with 5-point rating scale ranging from (1) not true at all, (2) slightly true, (3) moderately true, (4) Strongly true, and (5) totally true, resulting in a total score range of 16-80-points. The higher overall scores indicate that the caregiver has more overall family support.

5) The Home Environment Questionnaire developed by the researcher based on literature review[14,22-23] consists of 15 items that assessed two components of the home environment: indoor and outdoor in 2 aspects of home environment, indoor and outdoor with dichotomous questions (1) Yes and (0) No, resulting in a total score range of 0-15 points. The higher overall scores indicate that the caregiver has more overall suitable home environment for infection prevention.

Content validation of the questionnaires was performed by 5 experts consisting of: a physician specializing in pediatric cancer, two nurse instructors specialized in pediatric cancer, two nurses specialized in pediatric cancer. The content validity index (CVI) of infection prevention behaviors, health literacy, family support, and home environment questionnaire was calculated yielding the CVIs equal to 1, 1, 1, and 0.83 respectively. Reliability of the questionnaires was tested in 20 caregivers of children with cancer whose eligibilities were similar to that of the study sample. Reliabilities of the infection prevention behaviors questionnaire, the health literacy questionnaire, the family support

questionnaire using Cronbach alpha coefficient were .81, .82, and .85, respectively. Reliability of the home environment questionnaire Using Kuder-Richardson (KR-20) was .84.

Ethical Considerations

This study was approved by Mahidol University Multi-faculty Cooperative IRB Review, Certificate of Approval: MU-MOU-IRB-NS2022/55.0606. All eligible participants were thoroughly informed about the study's objectives and the data collection. Participants were informed that their choice to refuse participation in the study, and refusal to participate would not affect the quality of the treatment. The written consent forms were obtained from the participants who agreed to participate in the study. Names of participants were anonymous. All documents related to data collection would be destroyed one year after the publication of the study.

Data Collection

Once the Institutional Review Board (IRB) granted approval and permission was obtained for data collection, the researchers proceeded to meet the children and their caregivers. The first researcher introduced herself and explained the research's purpose and the benefits it could bring. Additionally, the data collection process was described, and the decision to participate in the trial was communicated. Once the caregiver consented to participate in the study, the researcher secured their formal written agreement to participate and requested permission to utilize information from the patient's medical records. The researcher instructed the participants to complete the questionnaires. The participants independently completed the questionnaire, which required approximately 45 to 60 minutes. The study was carried out between January and April 2023.

Data Analysis

The statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 18.0. The descriptive statistics encompassed frequency, percentage, minimum value, maximum value, mean, and standard deviation. Pearson product-moment correlation coefficient was employed to identify the relationship between the study factors. When the assumptions for statistical use were met, stepwise multiple regression was employed to identify the predictive power of each independent variable on the dependent variable. A p-value below 0.05 was considered statistically significant.

Findings

1. The caregivers consisted predominantly of women (87.5%, n = 70), namely mothers of children with cancer (77.5%). The age range was between 32 and 45 years (57.5%, n = 46) with mean 38.48 years old (SD = 9.15); and the majority were married (76.3%, n = 61). Education level completed either bachelor's degree (36.3%, n = 29) or secondary education (27.5%, n = 22). Additionally, 30% (n = 24) of caregivers were employed, while 28.8% (n = 23) were housewives or househusbands. The caregivers had salaries ranging between

10,000 and 20,000 baht (42.5%, n = 34) and between 20,001 and 40,000 baht (36.3%, n = 29). The majority of caregivers obtained knowledge regarding infection prevention for children undergoing CMT from health care professional (both nurses and physicians) 37.5% (n=30), followed by 20% from booklet provided from hospital (n= 16).

2. The children with cancer (n = 80) were predominantly male (66.25%, n = 53). Their age ranged from 1 to 5 years old (40%, n = 32), with an average age of 6.95 (SD = 3.99). The majority of the children (63.8%, n = 50) were diagnosed with Leukemia). A small percentage had Acute Myeloblastic Leukemia (AML) (6.3%, n = 5) or Chronic Myeloblastic Leukemia (CML) (2.5%, n = 2). Additionally, fewer children were diagnosed with Retinoblastoma (10%, n = 8). Most of their illness was in the maintenance phase, accounting for 58.75% (n = 47), followed by the intensification phase at 17.5% (n = 15). All children received chemotherapy treatment in accordance with the National protocol for the treatment of childhood cancers (ThaiPOG).

3. The analysis of the relationship between variables, including health literacy, family support, home environment, and infection prevention behaviors of caregivers, was conducted using Pearson product-moment correlation coefficient. The findings revealed that health literacy was correlated with caregivers' infection prevention behaviors at a low level ($r = .30$, $p < .01$), and with family support ($r = .43$, $p < .01$). Additionally, family support was significantly correlated with infection prevention behaviors ($r = .24$, $p < .05$). Correlation between home environment and infection prevention behaviors was not statistically significant, as displayed in Table 1.

Table 1 The correlations between health literacy, family support, home environment and caregivers' infection prevention behaviors (N = 80)

Factor(s)	1	2	3	4
1. Infection prevention behaviors	1			
2. Health literacy	.30**	1		
3. Family support	.24*	.43**	1	
4. Home environment	.13	.35**	.24*	1

*p < .05; **p < .01

4. The study employed stepwise multiple regression analysis to assess the predictive power of health literacy, family support, and home environment on caregivers' infection prevention behaviors. Table 2 demonstrates that health literacy was the sole determinant of infection preventive behaviors ($\beta = .30$, $p < .01$); and could explain 9% of the variance in the infection preventive behaviors.

Table 2 Stepwise multiple regression analysis of caregiver's infection prevention behaviors (N = 80)

Variable	Infection Prevention Behaviors				
	Model 1				
	B	β	t	p-value	95% CI
Constant	70.24**		4.24	< .001	[37.23, 103.24]
Health Literacy	.50**	.30	2.77	.007	[0.14, 0.86]
F	7.67**			.007	
R^2	.09				

CI = Confidence Interval

Discussion

The results of this study partially supported the research hypothesis, which showed that health literacy could predict infection prevention behavior of caregivers (β = .30, p < .01). An increase in caregivers' health literacy would result in the adoption of more suitable infection-prevention practices. The findings also indicated that the health literacy and infection prevention behaviors scores of the caregivers were high, with a mean of 116 (SD = 11.69) and a mean of 91.95 (SD = 7.02), respectively.

By seeking advice and consultation from medical professionals, caregivers of children with cancer gained access to crucial information. This enabled them to comprehend and analyze the information, allowing them to make informed decisions regarding the care of children undergoing cancer treatment. For instance, caregivers could be educated about the importance and severity of infections, enabling them to understand and address the potential risks faced by children receiving chemotherapy. Caregivers realized that the children exhibited a greater susceptibility to infection in comparison to their peers ($\overline{X}$ = 2.95, SD = 0.27). Caregivers with knowledge and understanding could make decisions and take necessary measures to prevent infection. The measures involved regular handwashing with soap or alcohol gel after exposure to germs before interacting with children ($\overline{X}$ = 2.91, SD = 0.28), providing freshly cooked food to children with cancer ($\overline{X}$ = 2.45, SD = 1.03), ensuring cleanliness and non-expiration of food packaging before giving it to the children ($\overline{X}$ = 2.93, SD = 0.41), and regularly cleaning bed sheets, pillowcases, and blankets to prevent dust accumulation ($\overline{X}$ = 2.93, SD = 0.27). The findings of this study were comparable with Sorensen's concept of health literacy, which states that individuals possess the capacity to utilize knowledge in healthcare, illness prevention, and health promotion. The findings of this study coincided with previous research that demonstrated a positive correlation between health literacy and the caring behaviors of caregivers responsible for children with chronic illness[2 5] and Acute Lymphoblastic

Leukemia (ALL).[12-13] However, caregivers must get education in various aspects of health literacy, including understanding the significance of immunizations, practicing good fruit selection and preparation, completing dental examinations, and preventing oral infections.

The findings of this study disproved the research hypothesis that family support could predict caregivers' infection prevention behaviors when controlling for the other factors. Nevertheless, this factor had a positive correlation with the infection prevention behaviors of caregivers ($r = .43$, $p < .01$). This could explain that increased family support for caregivers would result in the implementation of effective infection prevention behaviors. The findings also revealed that the scores of family support ($\overline{X} = 66.18$, $SD = 9.8$) and infection prevention behaviors ($\overline{X} = 116$, $SD = 11.69$) were high. It could be explained that the presence of a family living arrangement could contribute to supportive aspects of childcare, which in turn could lead to appropriate infection prevention behaviors by the caregivers. For instance, the family could help lighten the caregiver's workload by assisting with household chores such as cleaning and laundry ($\overline{X} = 4.23$, $SD = 1.19$). Additionally, they could provide useful items for cancer patients ($\overline{X} = 4.05$, $SD = 1.23$). Furthermore, 76.3% of the caregivers in this study were married and cohabiting with their family members, which provided them with assistance, encouragement, and relief from the responsibilities at home. Having a sufficient household income of 60% enabled the ability to afford necessary equipment or provide resources for children suffering from cancer. The findings of this study were consistent with the study of Sonkongdang, Kantawang and Niyomkar[12] which focused on caregivers of leukemia children aged 1-15, which found that informational support was positively correlated with food care behavior ($r = .44$, $p < .001$). The researchers suggested that this correlation may be attributed to the fact that the majority of caregivers (92%) received advice on dietary care and were encouraged to follow reinforced practices for preventing food-borne infections in children with leukemia who received CMT.

Finally, the findings of this study disproved the hypothesis that home environment could predict caregivers' infection prevention behaviors when controlling for the other factors. The results demonstrated that there was no significant relationship between home environments and infection prevention behaviors of caregivers ($r = .13$, $p > .05$). This result could be explained that the Home Environment questionnaire is dichotomous which the score interpretation could be divided only “Yes” or “No” and could be interpreted by only high or less appropriate environment for infection prevention behaviors. But the practices for infection prevention behaviors might be depended on resilience and adaptation to response to their context. For instance,

in circumstances where the environment was unsuitable or unable to be modified, such as the presence of garbage burning or car smoke near the residence, caregivers would adapt their actions accordingly to protect the child from infection by purchasing air filters, zoning, or requiring the patient to wear a mask indoors to prevent exposure to dust particles. Consequently, the home environment factor might not be the determining factor for predicting infection prevention behaviors.

Conclusion and Recommendations

Health literacy was the sole factor that influenced infection prevention behaviors among caregivers of children with cancer undergoing CMT. Although family support was not identified as a predictive factor in this study, there was a significant positive correlation with infection prevention behaviors of caregivers. The variable that exhibited non-significant correlation and lacked predictive power for the infection protection behaviors of caregivers of children with cancer undergoing CMT was the home environment.

Doctors and nurses should expand the availability of information to enhance health literacy of caregivers in all aspects. These include increasing access to information for caregivers through online platforms, implementing post-discharge tracking applications to improve access to health information and promote health literacy, expanding content on symptom management, and emphasizing the significance of vaccination and infection prevention in the future. This will promote better infection prevention behaviors among caregivers. Moreover, doctors and nurses should enhance family support by giving additional advice to family members to encourage family members to see the importance of caring for patients and to participate in expressing opinions or making decisions to solve problems together with caregivers.

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