Title: Comparing the Impact of Cancer and Treatment-Related Effects on Psychological Well-being and Quality of Life between Hong Kong Survivors of Childhood Solid Tumours and Leukaemia

Laurie Long Kwan HO, PhD Candidate, MPhil, RN; William Ho Cheung LI, PhD, MPhil, RN; Ka Yan HO, PhD, MPhil, RN; Ankie Tan CHEUNG, PhD Candidate, MPhil, RN; Godfrey Chi Fung Chan, DMD, MD, MRCP, FHKAM, FHKCPaed, FRCP (Edin), FRCPCH, FAAP; Sau Ying Chiu, MN, RN; Joyce Oi Kwan CHUNG, PhD, MPH, RN

Author Affiliations: School of Nursing, Li Ka Shing Faculty of Medicine, the University of Hong Kong, China (Ms Ho, Dr Li, Dr Ho, Ms Cheung and Dr Chung); Department of Paediatrics & Adolescent Medicine, Li Ka Shing Faculty of Medicine, the University of Hong Kong (Prof Chan); Paediatric Oncology Unit, Queen Mary Hospital, Hong Kong, China (Ms Chiu).

Correspondence: William Ho Cheung LI, PhD, MPhil, RN, School of Nursing, Li Ka Shing Faculty of Medicine, the University of Hong Kong**,** 4/F, William M.W. Mong Block**,** 21 Sassoon Road, Pokfulam, Hong Kong (william3@hku.hk).

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Background: Evidence shows that survivors of solid tumors have a lower survival rate and shorter disease-free survival time than survivors of leukemia. However, the psychological wellbeing and health-related quality of life (HRQOL) of these two groups of cancer survivors have not been compared.

Objective: To examine and compare the impact of cancer and treatment-related effects on psychological wellbeing and HRQOL between survivors of childhood solid tumors and leukemia.

Methods: We conducted a cross-sectional study involving 65 Hong Kong survivors of solid tumors and 70 survivors of leukemia aged 8–18 years who had their medical follow-up in a pediatric outpatient clinic. Participants' depressive symptoms, self-esteem, and HRQOL were assessed. Twenty-two survivors of childhood solid tumors and 15 survivors of childhood leukemia were then selected for semi-structured interviews.

Results: Survivors of childhood solid tumors reported significantly higher mean scores for depressive symptoms, and lower mean self-esteem and HRQOL scores than survivors of childhood leukemia. Qualitative data revealed that survivors of childhood solid tumors faced more challenges in their daily life than survivors of childhood leukemia.

Conclusions: Survivors of childhood solid tumors reported poorer psychological wellbeing and HRQOL than survivors of childhood leukemia. This vulnerable group warrants more attention and support.

Implications for Practice: It is vital for healthcare professionals to understand the impact of cancer and treatment-related effects in the context of different types of cancer. This will facilitate development and evaluation of appropriate psychological interventions to promote psychological wellbeing and HRQOL among childhood cancer survivors.

Keywords

Cancer; Chinese children; Childhood cancer survivors; Psychological wellbeing; Health-related quality of life; Nursing; Childhood solid tumors; Childhood leukemia

Introduction

Cancer is the second leading cause of death among children and adolescents aged from 0 to 19 years in Hong Kong.[1] The incidence of childhood cancer in Hong Kong is about 10 per 100,000 children with approximately 200 new cases diagnosed annually. [1] The incidences, types of childhood cancer, and the 5-year observed survival rates in Hong Kong are similar with those in Western countries.[2-4]

Advances in cancer screening and medical treatment mean the survival rates of childhood cancer have increased.[5] However, evidence indicates that the health sequelae of cancer and its treatment can greatly affect the psychological wellbeing and quality of life of childhood cancer survivors.[6-9] Depressive symptoms are the negative psychological sequelae most commonly reported by childhood cancer survivors.[10] A cohort study showed that childhood cancer survivors were 1.5 times more likely to experience depressive symptoms than their siblings.[11] A study involving Hong Kong Chinese childhood cancer survivors found that this group had lower levels of self-esteem than healthy school children.[7] In addition, numerous studies have indicated that childhood cancer survivors reported significantly lower levels of health-related quality of life (HRQOL) than their healthy counterparts.[7,9,12]

Two main types of cancer in children are blood cancer and solid tumor cancer.[13] Leukemia is the most common type of blood cancer in children, with a cure rate of 70%–80%.[14] However, children with solid tumors (e.g., brain tumor, osteosarcoma, Wilms tumor, hepatoblastoma, and gonadal germ cell tumors) have a comparatively lower survival rate (50%–65%) and shorter disease-free survival time than those with leukemia.[4, 15] Evidence shows that survivors of childhood solid tumors report poorer general health status, more somatic distress and a higher level of anxiety than their siblings.[16] Compared with survivors of childhood blood cancer, physical and mobility impairments are also commonly observed in survivors of childhood solid tumors as a result of invasive surgical treatment.[17-18] The physical wellbeing of childhood cancer survivors is positively associated with their psychological wellbeing.[17,19] Therefore, survivors of childhood solid tumors may be at a higher risk for experiencing psychological distress than other childhood cancer survivors. Physical and mobility impairments commonly found among survivors of childhood solid tumors include the presence of scars, limb deformities, and disfigured body image.[17, 20] An altered body appearance may also decrease survivors' self-perceived attractiveness, resulting in low self-esteem.[17, 21]

Previous local studies indicated that childhood cancer survivors presented more depressive symptoms, lower self-esteem, and poorer quality of life than their healthy counterparts.[6-7] However, those studies did not compare the impact of cancer and its treatment by different types of cancer. Specifically, the impact of cancer and treatment-related effects on survivors of two distinct types of childhood cancer (solid tumors and leukemia) remain unexplored. This study aimed to compare the impact of cancer and treatment-related late effects on psychological wellbeing and HRQOL between Hong Kong Chinese survivors of childhood solid tumors and leukemia.

Background

Children diagnosed with cancer have to suspend school attendance and their normal daily life activities are temporarily affected because of their treatment regimens. Even after cancer treatments are completed, survivors are affected by long-term physical and psychological sequelae. Childhood solid tumors may also require a longer recovery time as a result of receiving more invasive cancer treatment.[4] Statistics from the Hong Kong Children's Cancer Foundation suggest a more comprehensive treatment approach (e.g., combination of surgical and chemotherapy or radiotherapy treatment) is commonly adopted for treating childhood solid tumors, which may result in an increased number and severity of treatment-related symptoms.[3] Survivors of childhood solid tumors may therefore need extra time and effort to pursue academic success or other personal goals. Children with low achievements may also doubt their abilities, which may engender a sense of inferiority.[22] This significantly lowers self-esteem among children and adolescents.[22] In Hong Kong, children and adolescents are under a large amount of pressure from their parents' high expectations and the academic-orientated culture in Hong Kong society.[23] Failure in achieving goals may mean that Hong Kong Chinese survivors of childhood solid tumors are more susceptible to psychological distress and low levels of self-esteem. Consequently, the psychological wellbeing of Hong Kong Chinese survivors of childhood solid tumors may be adversely affected, such as experiencing low self-esteem and depressive symptoms.

Cultural differences may impose different impacts on the psychological wellbeing of childhood cancer survivors. The philosophical doctrines of Chinese culture, Taoism and Fatalism, emphasize the belief in fate and destiny, which influence how Chinese people interpret their diseases. In other words, Chinese people tend to believe that there is a force beyond their control that dominates their fate.[24] Therefore, they believe there is nothing they can do to change their fate, including their cancer prognosis. This belief may mean Hong Kong Chinese survivors of childhood solid tumors have a high risk for developing depressive symptoms or may not seek help from others. Moreover, differences in coping strategies used by Chinese and Western children may also affect how they react and cope with the devastating effects of cancer and its treatments. For example, a previous study showed that Chinese children prefer using emotion-focused coping strategies, whereas Western children prefer adopting problem-focused coping strategies.[25] Differences in cultural beliefs and coping strategies mean that findings from studies in Western countries may not be applicable and transferable in the Hong Kong Chinese context.

Although Hong Kong Chinese childhood cancer survivors have regular follow-up after the completion of entire course of treatment, the nature of consultations are disease and treatment outcome orientated. There is an urgent need for healthcare professionals to examine the psychological wellbeing and HRQOL of Hong Kong Chinese survivors of childhood solid tumors. Moreover, to facilitate the development of appropriate psychological interventions for survivors, it is crucial to compare the impact of cancer and treatment-related effects on psychological wellbeing and HRQOL between survivors of childhood solid tumors and childhood leukemia.

Method

Study design and sample

We conducted a cross-sectional study using both quantitative and qualitative approaches. Participant recruitment was conducted at a large pediatric outpatient clinic located in an acute hospital in Hong Kong. About 160–190 childhood cancer survivors aged 8–18 years attend follow-up visits at this clinic annually. Convenience sampling was used to recruit participants, with at least 60 survivors for each group (childhood solid tumors and childhood leukemia) targeted according to the disease proportions and available participants in the recruitment site. From September 2017 to August 2018, we recruited 65 survivors of childhood solid tumors and 70 survivors of childhood leukemia. The response rate was 92%; 11 participants refused to join the study because of unavailability or no interest in participating. In this study, we defined childhood cancer survivors as individuals who were diagnosed with cancer during their childhood and completed the entire course of treatment for at least 6 months. Childhood cancer survivors were recruited if they were: 1) Hong Kong Chinese aged 8–18 years; 2) diagnosed with solid tumors or leukemia; and 3) able to speak Cantonese and read Chinese. Survivors with secondary malignancy or recurrence, organically caused psychosis, and identified cognitive or learning problems were excluded.

Instruments

Sociodemographic and disease-related variables

Sociodemographic data included age, sex, and parent’s educational level. Disease-related variables included cancer diagnosis, types of treatment received, and time since treatment was completed.

HRQOL

Four domains of HRQOL were assessed: physical ability, psychological status, social relationships, and school functioning. These domains were measured by the Chinese version of the Pediatric Quality-of-Life Inventory 4.0 Generic core scales (PedsQL 4.0).[26] This instrument was developed for children aged 2–18 years and consists of 23 items that investigate their experience over the last month. Responses are on a five-point Likert scale from 0 (Never a problem) to 4 (Almost always a problem). Reverse scoring is needed and scores are linearly transformed into a scale of 0–100 (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0). Higher scores indicate better HRQOL. The Chinese version of the PedsQL 4.0 has good internal consistency (Cronbach’s $\alpha = 0.90$).[27]

Depressive symptoms

Depressive symptoms were measured using the Chinese version of the Center for Epidemiological Studies Depression Scale for Children (CES-DC), which is derived from the Center for Epidemiological Studies Depression Scale for Adults. The 20-item scale investigates children's and adolescents' experiences over the past week. Responses are on a four-point Likert scale from 0 (Not at all) to 3 (A lot). Higher scores indicate more depressive symptoms. The psychometric properties of the Chinese version of the CES-DC have been tested, and the scale has good internal consistency (Cronbach's $\alpha = 0.82$) and strong agreement with the Chinese version of the State Anxiety Scale for Children (Pearson's correlation = 0.63).[28]

Self-esteem

Self-esteem was assessed by the Chinese version of the Rosenberg Self-Esteem Scale (RSES).[29] The RSES consists of 10 items with responses on a four-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). Higher scores indicate higher levels of self-esteem. The RSES has been widely used in the Chinese population, and has been shown to have good reliability and validity.[7,30]

Semi-structured interviews

Participants were randomly selected to attend individual semi-structured interviews. The interviews aimed to explore differences in psychological wellbeing and HRQOL between the two groups, in particular the lived experiences and challenges faced by survivors of childhood solid tumors and leukemia. The interview sample size was determined by data saturation, which was achieved after interviewing 22 survivors of childhood solid tumors and 15 survivors of childhood leukemia.

A semi-structured interview guide was developed to explore four major areas: challenges faced by survivors, changes in physical and psychosocial wellbeing during survivorship, perceptions of evaluation from others, and personal future prospects. The interviews began with some factual questions related to cancer or its treatment; for example, "When did you receive your last treatment?" This was followed by questions related to major areas in the interview guide (e.g., “How have the sequelae of cancer and its treatment affected your daily life?” or “Do you feel that your physical condition is different from others’?”). Nondirective and repetitive supplementary questions (e.g., “Why do you feel like this?” or “Can you give me some examples?”) were used to elicit more detailed information. Different probing techniques were also applied throughout the interviews to evoke more responses and comprehensive information.

Data collections

Ethical approval was obtained from the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster. The study involved children and adolescents who were considered vulnerable subjects and the principles of Declaration of Helsinki were strictly followed to protect participants’ rights.

We identified eligible childhood cancer survivors at the pediatric outpatient clinic located a large acute hospital in Hong Kong when they attended medical follow-up. Written informed consent was obtained from participants’ parents. Children were also asked to sign a child assent form to indicate their willingness to join the study. We assured parents and children about the voluntary nature of participation, that children could withdraw from the study at any time, and that the confidentiality of the information collected would be maintained. All participants were asked to complete a set of questionnaires, which included a demographic sheet and the Chinese versions of the PedsQL 4.0, CES-DC, and RSES. In addition, participants were randomly selected for individual interviews, which lasted for approximately 20–30 minutes and were conducted in a private meeting room. Interviews were audio-taped with participants’ permission.

Data analysis

SPSS Statistics for Windows, Version 23.0 (IBM Corp, Armonk NY, United States) was used for quantitative data analysis. Chi-square tests were used to compare the sociodemographic and clinical characteristics between survivors of childhood solid tumors and leukemia. Descriptive statistics (mean and standard deviation) were used to evaluate the PedsQL 4.0, CES-DC, and RSES scores. Independent *t*-tests were used to compare the mean scores of the PedsQL 4.0, CES-DC, and RSES between survivors of childhood solid tumors and leukemia.

Colaizzi's[31] descriptive phenomenological data analysis strategy was used for analyzing the qualitative data. All interview recordings were transcribed verbatim into Cantonese to capture the content of the dialogue and physical expressions accurately. Important quotes relevant to the themes were identified and translated into English. First, the transcripts were reviewed intensively several times to gain a general sense of the constructs or ideas in the content. Then, content relevant to the major areas covered in the interview guide were extracted and labeled as significant statements. These significant statements were used to formulate different meanings about the content. The formulated meanings were then grouped into categories and themes by examining and identifying their similarities. Finally, exhaustive descriptions emerged from the themes.

The quality and rigour of qualitative study, in terms of credibility, transferability, dependability and confirmability, were achieved by a number of strategies. To enhance credibility, strategies of triangulation were adopted, including taking field notes throughout the interviews for capturing any supplementary nonverbal cues and involving two researchers in the process of data analysis.[32] This could ensure the consistency of the findings by collecting data from different methods and achieve a more comprehensive data analysis. Moreover, member-checking was used to establish credibility by validating the result with participants.[32] In addition, enough privacy was provided throughout the interviews by offering a safe and secure environment for participants. Confidentiality was also assured. Participants were encouraged to feel free to express their feeling and ideas honestly. Transferability was shown through similarities to other research findings, and enhanced by using direct quotes and explicit descriptions of participants' experience.

The technique of stepwise replication was used to achieve dependability.[33] The technique involved two researchers analyzing the data independently and then comparing the findings. This could ensure the stability and consistency of the findings. In addition, all the interviews were carried out by the same researcher for maintaining consistency. Finally, confirmability can be improved by reflecting on the process of data analysis.[33] To maintain the objectivity, the two researchers recorded the procedures of data analysis and made reflections on it from time to time. Research team meetings were held at regular intervals to monitor the data analysis process and manage any divergence of opinion.

Results

Participants' sociodemographic and clinical characteristics are shown in Table 1. There was a significant association between cancer diagnosis and types of treatment received: χ^2 (4, n = 135) = 92.9, $p \leq .001$. More than 50% of survivors of childhood leukemia received chemotherapy, whereas a mixed treatment method and surgical interventions were more commonly adopted in treating childhood solid tumors. Table 2 shows that the most common diagnosis in the solid tumors group was brain tumors (27.7%), followed by osteosarcoma (15.4%), Wilms tumors (12.3%), and retinoblastoma (6.2%).

The mean scores for the Chinese versions of the PedsQL 4.0, CES-DC, and RSES among participants in the two groups are shown in Table 3. Overall, survivors of childhood solid tumors reported higher mean CES-DC scores but lower mean PedsQL 4.0 and RSES scores than survivors of childhood leukemia. These results indicated that survivors of childhood solid tumors presented more depressive symptoms, and had lower self-esteem and HRQOL than survivors of childhood leukemia. The independent sample *t*-tests showed that there were statistically significant differences ($p \leq .01$) in mean PedsQL 4.0, CES-DC, and RSES scores between survivors of childhood solid tumors and childhood leukemia. These mean differences ranged from small to medium effect sizes (.07 to .18).

We randomly selected 22 survivors of childhood solid tumors and 15 survivors of childhood leukemia for individual interviews. Three main themes were identified from the qualitative data: T1) functional and structural impairments; T2) learning and school issues; and T3) planning for the future in the face of uncertainty. Each theme was further divided into subthemes. A summary of themes and subthemes with example quotations is presented in Table 4.

A majority of the survivors of childhood solid tumors mentioned that cancer and treatment-related late effects exerted a profound negative effect on their physical function and appearance during survivorship. These effects caused disruptions in their normal daily life and body image, which jeopardized their psychological wellbeing. In contrast, survivors of childhood leukemia thought that their physical functions had returned to the level that they used to be and seldom considered the delayed health sequelae to be a disturbance.

Childhood cancer survivors have to temporarily suspend school attendance because of cancer and treatment. However, survivorship of childhood solid tumors requires a longer rehabilitation time compared with survivorship of childhood leukemia, and these children needed to make extra efforts to catch up with their studies. Some survivors of childhood brain tumors reported that they experienced memory and attention problems after the cancer trajectory.

Additionally, some survivors of childhood solid tumors preferred not to join any social events to conceal negative changes in their body appearance and physical ability.

A majority of the survivors of childhood solid tumors expressed worries about the future. They worried about being labeled as “childhood cancer survivors” because of their altered body appearance or physical impairments when they started to reintegrate into society. A few participants also expressed concerns about finding jobs because of their poor academic performance or physical impairments. In the long-term, some survivors of childhood solid tumors were fearful of recurrence or secondary malignancy. They mentioned that they understood they had a higher recurrence rate than other childhood cancer survivors, as informed by their physicians. Therefore, they felt that their future was full of uncertainty and expressed feelings of hopelessness about their future. In contrast, a majority of the survivors of childhood leukemia considered that they were cured, although some were worried about recurrence or secondary malignancy. Most of these participants expressed a positive attitude towards the future, and mentioned that they had clear and definite goals.

Discussion

To our knowledge, this is the first study to explore and compare psychological wellbeing and HRQOL between Hong Kong Chinese survivors of childhood solid tumors and survivors of childhood leukemia. We found that Hong Kong Chinese survivors of childhood solid tumors reported more depressive symptoms and lower self-esteem and HRQOL than survivors of childhood leukemia. In particular, our findings revealed that more than half (63%) of survivors of childhood solid tumors reported a CES-DC score of 16 or above, which suggests the presence of some depressive symptoms and an increased risk for depression.[34] Our findings were consistent with a previous local study[5] and several Western studies,[12, 35] which indicated that a majority of childhood cancer survivors present some depressive symptoms and are potentially at risk for depression. However, our study also showed that Hong Kong Chinese survivors of childhood solid tumors are more vulnerable to depressive symptoms and at a higher risk for depression than survivors of childhood leukemia.

The qualitative information in this study provided new insights into the lived experience and challenges among survivors of childhood solid tumors and leukemia. The findings suggested several possible reasons to explain why survivors of childhood solid tumors were more susceptible to psychological distress than survivors of childhood leukemia. The most common issues described by survivors of childhood solid tumors were facing major challenges in their daily life as a result of treatment-related late effects and feelings of uncertainty about their prognosis. They struggled for normalcy after the cancer trajectory in the face of functional and structural body impairments caused by long-term sequelae. In addition, their visible altered body appearance became the most obvious indicator of their disease. This negatively affected their perceived self-attractiveness, which can adversely affect self-esteem and psychological wellbeing.

Survivors of childhood solid tumors also expressed more difficulties in rebuilding their social networks than survivors of childhood leukemia. As social support is a crucial element to reduce psychological distress and promote coping for childhood cancer survivors,[36] their inability to ask for social support and build social networks might have made them less able to withstand the devastating effects of cancer and treatment-related late effects. Moreover, the prolonged recovery time and treatment-related late effects meant that some survivors of childhood solid tumors reported unsatisfactory school performance, which made them more susceptible to psychological problems such as low self-esteem. Conversely, a majority of survivors of childhood leukemia were capable of readapting to their life after the cancer trajectory.

The results of this study reflect two main factors that can be observed specifically in the Hong Kong Chinese context. First, there is inadequate community support in Hong Kong targeted to survivors of childhood solid tumors compared with that provided in Western countries, such as psychological support groups[37] and survivorship programs (including late effects management).[38] Lack of psychosocial support jeopardizes the psychological wellbeing and HRQOL of survivors of childhood solid tumors.[39] Second, because the choice of coping strategies is influenced by cultural factors, the adoption of emotional coping strategies among Hong Kong Chinese survivors of childhood solid tumors may make them more vulnerable to psychological distress. Our qualitative findings implied that survivors of childhood solid tumors suffered more challenges in their academic studies and social life compared with survivors of childhood leukemia. However, they tended to escape from problems rather than to find solutions when they were facing difficulties. They seldom asked for social support, making them more susceptible to psychological distress. Most importantly, our findings indicated that survivors of childhood solid tumors presented feelings of hopelessness due to their uncertainty about the future. Previous studies[40-41] showed that hope is essential for childhood cancer survivors to enhance their psychological wellbeing and prevent psychological disorders. Therefore, feelings of hopelessness had profound negative effects on the psychological wellbeing and HRQOL of survivors of childhood solid tumors.

Strengths and limitations

This study addressed an important health issue; that is, the psychological wellbeing and HRQOL of Hong Kong Chinese survivors of childhood solid tumors, which has been underexplored. This research was original and helped to clarify the impacts of cancer and its adverse treatment effects on psychological wellbeing and HRQOL among survivors of childhood solid tumors and leukemia.

There are approximately 200 new cases of cancer in children and adolescents aged 0–19 years diagnosed annually in Hong Kong.[1] In this study, participant recruitment was conducted at a large pediatric oncology clinic over a 10-month period. According to the information provided by the clinic, around 160–190 childhood cancer survivors aged 8–18 years receive follow-up there annually. Therefore, although the sample size of this study was small, it can be considered to be a representative sample of survivors of childhood solid tumors and leukemia in Hong Kong.

To better understand the impact of cancer and its adverse treatment effects on the psychological wellbeing and HRQOL of survivors of childhood solid tumors and leukemia, this study adopted a mixed methods approach, and used quantitative and qualitative methods to address the research question. The results of this study present a comprehensive picture that clearly explains the differences in impact of cancer and its adverse treatment effects between survivors of childhood solid tumors and leukemia.

This study had some limitations. First, the generalizability of our findings may be limited as this study used a convenience sample. Second, the cross-sectional study design only revealed associations, and did not identify causal relationships among outcome variables. Third, the study was designed to collect data at one point in time. Emotions are transient, and the level of depressive symptoms and HRQOL may fluctuate over time as a response to the environment. A longitudinal study is therefore recommended to explore the long-term impact of cancer and treatment-related late effects among Hong Kong Chinese survivors of childhood solid tumors.

Fourth, only a small number of long-term survivors who completed treatment more than 5 years ago were recruited for this study. This may be attributable to their follow-up schedules, which may not be as intensive as those surviving from cancer for a shorter period of time. However, the present findings may not be generalizable to long-term survivors of more than 5 years. Fifth, the qualitative findings revealed that survivors of solid tumors faced more challenges and were potentially at a higher risk of suffering from psychological distress than survivors of other types of cancer. It is recommended that future study should explore and compare the impact of cancer and treatment-related effects on the psychological wellbeing and HRQOL among survivors of childhood brain tumors, other solid tumors and leukemia.

Implications for nursing practice and future research

The findings of this study make an important contribution to improving healthcare professionals' understanding about the psychological needs of childhood solid tumors survivors. Such understanding can facilitate the design and implementation of appropriate interventions for this vulnerable group. Specifically, by providing adequate supportive resources for survivors of childhood solid tumors, holistic care can be achieved that can optimize their physical, psychological, and social wellbeing.

This study revealed that survivors of childhood solid tumors expressed feelings of hopelessness. As hope is considered to an essential element to enhance childhood cancer survivors' psychological wellbeing,[40-41] future studies could focus on investigating the level of hope among Hong Kong Chinese childhood cancer survivors and examining the effectiveness of hope interventions for promoting psychological wellbeing. The results of this study may also raise healthcare professionals' awareness about the possible differences in psychological wellbeing among different groups of childhood cancer survivors. Particular needs among different groups of childhood cancer survivors should be addressed by developing and implementing appropriate interventions.

Conclusions

This study addressed a literature gap by comparing the impact of cancer and treatment-related late effects on the psychological wellbeing and HRQOL between Hong Kong Chinese survivors of childhood solid tumors and leukemia. The findings may help inform healthcare professionals that it is essential to design and evaluate appropriate interventions to enhance the psychological wellbeing and HRQOL of survivors of childhood cancer, particularly those who recovered from childhood solid tumors.

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Table 1. Sociodemographic and Clinical Characteristics of Survivors of Childhood Solid Tumours and Those of Leukaemia

	Frequency (%)			
	Survivors of childhood solid tumours (n=65)	Survivors of childhood leukaemia (n=70)	x^2	p
Sex			<0.001	1.00
Male	31 (47.7)	34 (48.6)		
Female	34 (52.3)	36 (51.4)		
Types of treatment received			92.9	<.001[a]
Surgery	20 (30.8)	/		
Radiotherapy	3 (4.6)	/		
Chemotherapy	/	45 (64.3)		
Bone marrow transplant	/	11 (15.7)		
Mixed method	42 (64.6)	14 (20.0)		
Time since treatment completed			0.3	.10
6-12 months	16 (24.6)	18 (25.7)		
13-24 months	15 (23.1)	15 (21.4)		
25-36 months	13 (20.0)	14 (20.0)		
37-48 months	10 (15.4)	9 (12.9)		
48-60 months	8 (12.3)	10 (14.3)		
>60 months	3 (4.6)	4 (5.7)		
Parents' educational level			2.2	.33
Primary	4 (6.2)	4 (5.7)		
Secondary	28 (43.1)	39 (55.7)		
University degree or above	33 (50.8)	27 (38.6)		
	Mean (SD)		*t*-value	*p*-value
Age, yr	12.48 (2.8)	12.47 (3.2)	0.1	1.00

[a] Significant at $p < .05$

Table 2. The Frequency of Particular Diagnoses among Survivors of Childhood Solid Tumours

Diagnosis	Frequency	%
Brain tumours	18	27.7
Osteosarcoma	10	15.4
Wilms’ tumours	8	12.3
Neuroblastoma	7	10.8
Hepatoblastoma	7	10.8
Gonadal germ cell tumours	6	9.2
Rhabdomyosarcoma	5	7.7
Retinoblastoma	4	6.2

Table 3. Mean Scores for the PedsQL 4.0, CES-DC and RSES of Survivors of Childhood Solid Tumours and Those of Leukaemia

	Mean (SD)				
	Survivors of Childhood Solid Tumours (n=65)	Survivors of Childhood Leukaemia (n=70)	*t* value[a]	*p*-value	Eta Squared
HRQOL	68.75 (9.74)	73.37 (10.62)	–2.63	.01[b]	0.05
Depressive symptoms	19.02 (7.91)	14.36 (9.43)	3.10	.002[b]	0.07
Self-esteem	23.97 (6.06)	27.69 (5.88)	–3.62	<.001[b]	0.09

[a] Independent sample *t*-test

[b] Significant differences between two groups by independent sample *t*-test ($p < .05$)

Table 4. A Summary of Themes, Subthemes and Statements

Themes	Subthemes	Survivors of childhood solid tumours	Survivors of childhood leukaemia
		Examples of statements	
Functional and structural impairments	Somatic symptoms	*'I have a severe headache at least three times a week. Because I can't sleep well, I always feel sleepy during the daytime.'* – **Child B, aged 16 years, a survivor of a brain tumour.** *'My eyes are always dry. I need to apply eye drops at regular intervals. It feels so annoying.'* – **Child J, aged 15 years, a survivor of retinoblastoma.**	*'Sometimes, I feel fatigue but it is alright for me. It's just like feeling sleepy after a full lunch.'* – **Child M, aged 16 years, a survivor of leukaemia.**
	Diminished physical function	*'I feel really frustrated because I cannot do many things by myself now. Even if I want to go to the toilet, I need someone to help me. You know, it is just like I am a useless person.'* – **Child P, aged 17 years, a survivor of osteosarcoma.** *'I can't play football and go cycling now… My leg will feel painful.'* – **Child R, aged 10 years, a survivor of rhabdomyosarcoma.**	*'Basically, my physical function is quite like what I used to be in the past.'* – **Child C, aged 16 years, a survivor of leukaemia.**
	Disturbed body image	'*I must wear a hat when I go out because I lost nearly all my hair. It's so ugly… I do not want others to see it.'* – **Child A, aged 16 years, a survivor of a brain tumour.** *'I can't wear a dress anymore. The surgery left me with a long scar on my right leg and I do not want to expose it.'* – **Child V, aged 18 years, a survivor of osteosarcoma.** *'I have a little sunken area over my head. It's so ugly.'* – **Child Y, aged 12 years, a survivor of a brain tumour.**	*'I became nearly bald when I was undergoing active treatment. After I had completed the whole course of treatment, my hair started to grow back ... Now, it returns back.'* – **Child W, aged 17 years, a survivor of leukaemia.**

Learning and school issues	Academic performance	*'I do not want to listen to what teachers say during the lessons… I can't remember things well… I often gain very low marks in examinations… I feel unhappy.'* – ***Child E, aged 12 years, a survivor of a brain tumour.*** *'I need to have operations for my leg at regular intervals. The old screws need to be replaced by new ones so that I can keep walking. Sometimes it took me around four months for recovery. This creates a big problem for me because I cannot go to school after the surgery. It makes it very hard for me to catch up on the study progress.'* – ***Child G, aged 18 years, a survivor of osteosarcoma.***	*'I don't need to be absent anymore. I can attend all the lessons… I gained high marks in the last examination. I feel very happy.'* – ***Child T, aged 11 years, a survivor of leukaemia.*** *'At first, I needed to have follow-up every three months, then it became once a half year and now I only need to have follow-up once a year. It really bothered me a lot at first because I needed to be absent from school frequently… However, everything is returned to normal now.'* – ***Child S, aged 14 years, a survivor of leukaemia.***
	Ability to build up a social network	*'I don't like to play with my classmates. I always lose the game because I cannot run as fast as they can.'* – ***Child I, aged 11 years, a survivor of rhabdomyosarcoma.*** *'I don't want people to treat me differently. I just want to be a normal person. I hate the feeling that they seem to treat me like a sick person.'* – ***Child O, aged 16 years, a survivor of a brain tumour.***	*'I am a repeater in my class but my new classmates do not know I have had cancer before… Of course, I feel sad because all my old friends are studying in secondary school now, however, I also have many new friends.'* – ***Child K, aged 13 years, a survivor of leukaemia.***
Planning for the future in the face of uncertainty		*'Doctor told me that my disease has a very high recurrence rate … I would not expect too much in my future.'* – ***Child D, aged 16 years, a survivor of hepatoblastoma.*** *'I do not have any plan for the future. I do not know what I can do and what I will be in the future.'* – ***Child Z, aged 17 years, a survivor of Wilm's tumour.***	*'I know I am cured now… The cancer experience made me treasure every moment of my life. I want to make my life become more meaningful.'* – ***Child U, aged 17 years, a survivor of leukaemia.***