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Education in Moroccan Long-Term Childhood Cancer Survivors

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Abstract: In developed countries, currently more than 80% of children with cancer survive and they are considered as cured. However, the survivors are at high risk of medical and social late effects. In Morocco, childhood cancer accounts for 3% of all cancers. The purpose of this study was to look for factors related to education in Moroccan childhood cancer survivors. This was a cross-sectional study conducted among childhood cancer survivors treated between 1978 and 2004 at the Pediatric Oncology Unit of Children's Hospital of Rabat. Medical and demographic data were collected through questionnaires completed by phone or internet, by the survivor, his parent or his physician. Among 995 patients considered cured, only 195 were found. The decline from the initial diagnosis varies from 10 years to 36 years, with a mean of 16.2 years and a standard deviation of 6.3 years. Educated survivors are more likely to live with their partner ($P < 0.0001$), and most of them are students ($P < 0.0001$). They have less cognitive problems than the not educated ($P < 0.0001$). To our knowledge, there is no previous study about the fate of Moroccan childhood cancer survivors before our study. Hence, it was a cross-sectional study to have a quick picture on the situation in Morocco. This survey revealed that Moroccan survivors didn't suffer from education problems. Actually, most of them continued their education during or after their treatment.

Key words: Childhood, cancer, survivors, education, Morocco.

1. Introduction

Children's malignant tumors are major causes of death in children under 15 years old in the West [1]. According to data from literature, childhood cancers are dominated by leukemia, tumors of the central nervous system (CNS) tumors of the bone and soft tissue [2]. Young people cured of childhood cancer may develop complications related to the disease itself or the treatment. With advances in cancer treatment, today more than 80% of children diagnosed with cancer in developed countries are alive at least five years after diagnosis. Many ultimately will be considered cured [2]. Surgery, chemotherapy, and radiation are associated with late health effects that can affect survivors' physical, psychosocial and cognitive functioning [3-6]. Many survivors report education difficulties, and hence unemployment, and lower incomes in comparison with siblings populations [7-11]. The impact of childhood Moroccan childhood cancer survivors on occupational achievement, however, has not been reported yet to our knowledge.

The North American Childhood Cancer Survivor Study (CCSS) showed reduced education attainment level and diminished cognitive functioning encompassing memory, quantitative skills, and abstract reasoning have been well documented in selected groups of survivors of childhood cancer. Deficits have been seen most often in children with acute leukemia or CNS tumors who received cranial radiation and/or intrathecal therapy. The subgroup of survivors who received special education services was found to have

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high school graduation rates similar to those of the sibling cohort, with the only exception being survivors of CNS cancers and Wilms tumor. Although a high proportion of childhood cancer survivors will successfully complete high school, the results of this CCSS analysis provides support for closely monitoring survivors and for early identification of signs of learning disabilities so that special education intervention can be planned [12].

The objective of the study was to establish a long term follow up of survivors and identify medical and social disorders. The aim of this present survey was to describe education in childhood cancer survivors treated at pediatric oncology unit of the University Children Hospital of Rabat between 1978 and 2004 in order to evaluate late effects on their social, economic and demographic outcomes.

2. Materials and Methods

2.1 Type of Study

This was a full coverage descriptive cross-sectional study.

2.2 Study Population

The study population consists of young people cured from childhood cancer (0 to 15 years) treated in Pediatric Oncology Unit of the Children Hospital of Rabat between 1978 and 2004. These young people were CR1 (complete remission without relapse) CR2 (complete remission after a single relapse) and CR3 (complete remission after 2 relapses).

This study has been presented to the local ethics committee of University Hospital Hassan II of Fez who agreed it. Informed consent has been sent to every potential participant. Questionnaires, upon receipt, have been assigned a unique number and at any time during the analysis of the study no person had been cited. These points were clearly stated in the informed consent so that the survivor of childhood cancer was not reluctant to give confidential information.

2.3 Data Collection

Initial and current medical and demographic data were collected through questionnaires completed by phone or internet by the survivor himself, his parent or his physician. Each subject enrolled in the study was contacted by phone or internet in order to present the purpose of the investigation and explain the necessity of participation of each subject. The revival was made for subjects who did not respond by telephone using social networks (facebook ...).

2.4 Statistical Analysis

All variables were summarized by using descriptive statistics. Categorical variables were described in terms of proportions and quantitative variables were described in terms of average extreme values and standard deviation.

The association between dependent variable (education level) and several potential explanatory variables was investigated. Bi-variate analysis was used and the association between two categorical variables (for example education level and sex) was searched by chi-square test, and was selected as the significance level a *P* value of 0.05. Statistical analysis was done on SPSS Version 17.

3. Results

Among 995 patients considered cured by their last news, only 195 were found. Five (5) deaths from second malignancy or late relapse were included in our database.

3.1 Descriptive Data

The decline from the initial diagnosis varies from 10 years to 36 years, with a mean (an average) of 16.2 years and a standard deviation of 6.3 years. The male was dominant with Sex Ratio of 1.7. The range of ages of children varies from 1 month to 16 years, with a mean of 6.2 years and a standard deviation of 3.9 years. Ages 0-9 years were the most represented, totaling 77.8%. More than 50% of the survivors

completing questionnaires were diagnosed and treated during the period from 2000 to 2004 and 75% from 1995 to 2004. The majority of our study population lived in urban areas (77%).

The majority of the survivors had acute lymphoblastic leukemia (ALL) (26.4%), No Hodgkinien Lymphoma (23.6%), Hodgkin Disease (14.8%) and nephroblastoma (14.8%). Almost all of the patients received chemotherapy, one third was operated on and one third irradiated. The vast majority of survivors never relapsed.

The majority of the participants were aged more than 18 years old (71.6%) and 31were married (16.1% of adults). They were aged between 23 and 43 (the mean was 31.8 and the SD is 5.9). 19 (61.3%) were employed and 9 (37.5%) makes sports (at least 3 hours per week) (Table 1).

3.2 Correlations Education/Other Variables

Educated survivors are more likely to live with their partner ($P < 0.0001$), and most of them are students ($P < 0.0001$). We didn't find relation statistically significant between education level and sex ($P = 0.810$). No correlations have been found with education level and sport practice (Table 2).

Educated survivors have less cognitive problems than the not educated ($P < 0.0001$). We didn't find relation statically significant between education level and aesthetic problems, or psychological problems. We found a P value close to significance between education level and addiction (0.059) (Table 3).

With the question of health subjective evaluation, we didn't find a relation statistically significant with education level ($P = 0.315$) (Table 4).

Table 1 Descriptive data among 195 Moroccan childhood cancer survivors treated between 1978 and 2004.

		Frequency	Percentage (%)
Sex (n = 190)	Female	69	36.3
	Male	121	63.7
Education	Not educated	1	0.6
	Primary School	21	12.0
	Middle School	56	32.0
	High School	34	19.4
	College/University	63	36.0
Adult (≥ 18 years old) (n = 194)	Yes	139	71.6
	No	55	28.4
Marital status (n = 139)	Ever Married	31	22.3
	Not married	108	77.7
Age at diagnosis in years (n = 189)	00-04	81	42.9
	05-09	66	34.9
	10-15	39	20.6
	15-19	3	1.6
Years of diagnosis (n = 185)	1978-1984	7	3.8
	1984-1989	19	10.3
	1990-1994	20	10.8
	1995-1999	33	17.8
	2000-2004	106	57.3
Origin at diagnosis (n = 183)	Urban	142	77.6
	Rural	41	22.4
Evolution	CRR	148	93.0
	CR2	9	5.7
	CR3	2	1.3

Table 2 Comparison of education level with t socio-demographic data among 195 Moroccan childhood cancer survivors treated between 1978 and 2004.

		Not educated	Primary school	Middle school	High school	College/university	*P* value
Sex (*n* = 173)	Female	0 (0.0%)	7 (33.3%)	22 (39.3%)	11 (32.4%)	26 (41.3%)	0.810
	Male	1 (100.0%)	14 (66.7%)	34 (60.7%)	23 (67.6%)	37 (58.7%)	
Age initial at diagnosis (*n* =174)	00-04	1 (100.0%)	13 (61.9%)	32 (57.1%)	15 (44.1%)	17 (27.4%)	0.029
	05-09	0 (0.0%)	5 (23.8%)	18 (32.1%)	14 (41.2%)	24 (38.7%)	
	10-14	0 (0.0%)	2 (9.5%)	6 (10.7%)	5 (14.7%)	20 (32.3%)	
	15-19	0 (0.0%)	1 (4.8%)	0 (0.0%)	0 (0.0%)	1 (1.6%)	
Habitat type (*n* =163)	With parents	0 (0.0%)	17 (85.0%)	44 (89.8%)	27 (84.4%)	35 (57.4%)	0.000
	Alone	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (6.2%)	13 (21.3%)	
	With partner	1 (100.0%)	3 (15.0%)	5 (10.2%)	3 (9.4%)	13 (21.3%)	
Working status (*n* = 70)	Employed	0 (0.0%)	8 (40.0%)	16 (29.6%)	6 (18.8%)	1 (1.6%)	0.000
	Unemployed	1 (100.0%)	4 (20.0%)	6 (11.1%)	5 (15.6%)	30 (47.6%)	
	Student	0 (0.0%)	8 (40.0%)	32 (59.3%)	21 (65.6%)	32 (50.8%)	
Makes sport (at least 3 hours per week) (*n* = 43)	Yes	1 (100.0%)	11 (61.1%)	26 (55.3%)	16 (66.7%)	31 (58.5%)	0.813
	No	0(0.0%)	7 (38.9%)	21 (44.7%)	8 (33.3%)	22 (41.5%)	

Table 3 Comparison of marital status with current medical data among 195 Moroccan childhood cancer survivors treated between 1978 and 2004.

		Not educated	Primary school	Middle school	High school	College/university	*P* value
Physical Problems (*n* = 172)	Yes	1 (100.0%)	6 (28.6%)	17 (30.4%)	14 (42.5%)	22 (36.1%)	0.462
	No	0 (0.0%)	15 (71.4%)	39 (69.6%)	19 (57.6%)	39 (63.9%)	
Aesthetic Problems (*n* = 157)	Yes	0 (0.0%)	3 (15.8%)	9 (18.4%)	3 (9.7%)	9 (15.8%)	0.862
	No	1 (100.0%)	16 (84.2%)	40 (81.6%)	28 (90.3%)	48 (84.2%)	
Psychical Problems (*n* = 171)	Yes	0 (0.0%)	6 (28.6%)	8 (14.3%)	9 (27.3%)	11 (18.3%)	0.468
	No	1 (100.0%)	15 (71.4%)	48 (85.7%)	24 (72.7%)	49 (81.7%)	
Cognitive Problems (*n* = 172)	Yes	2 (100.0%)	19 (95.0%)	2 (3.6%)	1 (2.9%)	0 (0.0%)	0.000
	No	0 (0.0%)	1 (5.0%)	53 (96.4%)	33 (97.1%)	61 (100.0%)	
Addiction (*n* = 170)	Yes	55 (91.7%)	17 (85.0%)	1 (1.6%)	1 (3.0%)	5 (8.3%)	0.059
	No	5 (8.3%)	3 (15.0%)	55 (98.4%)	32 (97.0%)	55 (91.7%)	

Table 4 Comparison of education level with subjective health evaluation among 195 Moroccan childhood cancer survivors treated between 1978 and 2004.

	Not educated	Primary school	Middle school	High school	College/university	*P* value
Very good (*n* = 55)	1 (100.0%)	6 (28.6%)	11 (19.6%)	16 (47.1%)	21 (33.3%)	
Good (*n* = 45)	0 (0.0%)	6 (28.6%)	19 (33.9%)	3 (8.8%)	17 (27.9%)	
Average (*n* = 35)	0 (0.0%)	6 (28.6%)	12 (21.4%)	7 (20.6%)	10 (15.9%)	0.315
Bad (*n* = 8)	0 (0.0%)	2 (9.5%)	4 (7.1%)	1 (2.9%)	1 (1.6%)	
Very bad (*n* = 3)	0 (0.0%)	0 (0.0%)	2 (3.6%)	0 (0.0%)	1 (1.6%)	

4. Discussion

To our knowledge, there is no previous study about the fate of Moroccan childhood cancer survivors before our study. In Morocco, treatment of childhood cancer is dominated by curative treatment. Hence, it was a cross-sectional study to have a quick picture on the situation in Morocco. The study had to be exhaustive, but only 195 among 995 were found. The survivors were diagnosed between 1978 and 2004 and the survey was made on 2014, which means that we have decline from 34 to 10 years. Consequently, many of them have changed their coordinates. Furthermore, the questionnaire was elaborated to fill by the patients themselves, but some questionnaires were filled from medical records or by some participant's close

relatives. However, retrieved data are interesting, and require reflection on many levels.

Educational difficulties among survivors have been reported by many survivors, parents and teachers [13-15]. Survivors attain lower levels of education [16-19]. In our study, we found that Moroccan childhood cancer survivors didn't suffer from education exclusion. Actually, more than half of them (55.4%) have high school or university level. In comparison with siblings, our study population had better education level as in Moroccan general population about 40% is not educated [20]. One possible explanation is that childhood cancer can be a motivation for the children and their families to continue their education.

Many studies had reported sex differences among survivors education level, actually girls appears to be less educated than boys [21-23]. In our study, we didn't find a difference statistically significant between girls and boys.

In this study, we found that young age at diagnosis is a risk factor of low level of education ($P = 0.029$). Educated survivors are more likely to be employed ($P < 0.0001$) and so to have enough money to live alone or with their partner ($P < 0.0001$).

Cognitive problems are risk factor of low education level ($P < 0.0001$), the association between addiction and education level were close to significance ($P = 0.059$), it can be considered as risk factor of low level of education. Maybe if we increase the power of the study by including other survivors, we can have significant association.

5. Conclusion

The childhood cancer survivors are increasing in developed countries, but also in developing countries. However, they stay at risk of late medical and demographic issues. This survey revealed that Moroccan survivors didn't suffer from education problems. Actually, most of them continued their education during or after their treatment.

This follow-up should provide medical care also psychosocial and educational support for patients and their families.

5.1 What Is Already Know on This Topic

Children's malignant tumors are major causes of death in children under 15 years old. Young people cured of childhood cancer may develop complications related to the disease itself or the treatment. Many survivors report education difficulties, and hence unemployment, and lower incomes in comparison with siblings populations.

5.2 What This Study Adds

To our knowledge, there is no previous study about the fate of Moroccan childhood cancer survivors before our study. This survey revealed that Moroccan survivors didn't suffer from education problems.

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