







SARS-CoV-2 vaccination for adolescents and young adult patients treated at a specialist pediatric oncology unit

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Abstract

This brief report describes the SARS-CoV-2 vaccination program at our pediatric oncology unit. Adopting Italian regulations, patients treated for cancer within the previous 6 months were offered vaccination with the Pfizer-BioNtech vaccine if aged ≥ 16 years, and with the Pfizer-BioNtech or Moderna vaccine if aged ≥ 18 years. From March 24 to April 28, 2021, 80/89 adolescent and young adult patients enrolled were vaccinated, while nine refused the vaccine due to fear of side effects, disbelief regarding the pandemic, or lack of trust in the scientific community. The refusal rate in our cohort was lower than in the Italian general population.

KEYWORDS

adolescents, cancer, coronavirus, COVID-19, pediatric oncology, refusal, SARS-CoV-2, vaccination, young adults

1 | INTRODUCTION

Cancer patients undergoing oncological treatment are fragile. In multiple adult series, they have reportedly had disproportionately more severe outcomes after contracting the SARS-CoV-2 infection and developing coronavirus disease 2019 (COVID-19).¹⁻⁴

After a long period during which protection measures relied on isolation alone, a vaccination campaign against SARS-CoV-2 all over Europe began on December 31, 2020,⁵ offering a new real form of protection for fragile patients. The Italian societies of oncological medicine soon established that cancer patients should be promptly offered vaccination against SARS-CoV-2, if no known contraindications were present (no reported and confirmed cases of allergic reactions to the components of the vaccine, for instance). In particular, the Italian Pediatric Oncology Association (Associazione Italiana Ematologia Oncologia Pediatrica [AIEOP])⁶ advocated vaccination for pediatric cancer patients aged 16 years and over, based on available vaccine approval studies.⁷ For patients less than 16 years old, vaccination of parents and caregivers was advocated.

A vaccination campaign according to the Italian regulations was thus started at our Pediatric Oncology Department. This report briefly describes our patient population being offered the SARS-CoV-2 vaccination, who accepted and who refused, and the reasons why some patients refused to be vaccinated.

2 | RESULTS

From March 24 to April 28, 2021, patients at the Pediatric Oncology Unit of the Istituto Nazionale dei Tumori in Milan were enrolled for our vaccination program. Vaccines were administered at our outpatient clinics and on the ward.

The criteria for enrollment were as follows: if aged ≥ 16 years, patients could be given the Pfizer-BioNtech vaccine, and if ≥ 18 years old, they could be given the Pfizer-BioNtech or Moderna vaccine; patients had to be receiving oncological treatment at the time, or to have completed their treatments within the previous 6 months; an informed consent form had to be signed directly by patients ≥ 18 years old, or by their caregivers for those < 18 years old; and all patients

Abbreviation: COVID-19, coronavirus disease 2019.

TABLE 1 Patients' characteristics

	Vaccinated	Not vaccinated	Total
	80 (90%)	9 (10%)	89
Age			
Range (median)	16–26 (18)	16–28 (21)	16–28 (19)
Gender			
Female, <i>n</i> (%)	37 (46%)	2 (22%)	39 (44%)
Male, <i>n</i> (%)	43 (54%)	7 (78%)	50 (56%)
Region of origin			
Lombardia, <i>n</i> (%)	57 (71%)	6 (67%)	63 (71%)
Others, <i>n</i> (%)	23 (29%)	3 (33%)	26 (29%)
Educational qualification			
Secondary school, <i>n</i> (%)	31 (39%)	8 (89%)	39 (44%)
High school diploma, <i>n</i> (%)	42 (53%)	1 (11%)	43 (48%)
University degree, <i>n</i> (%)	7 (8%)	0	7 (8%)
Tumor types			
Bone sarcomas	21 (26%)	1 (11%)	22 (25%)
Soft tissue sarcomas	19 (24%)	1 (11%)	20 (22%)
CNS tumors	16 (20%)	4 (44%)	20 (22%)
Lymphomas	8 (10%)	1 (11%)	9 (10%)
Others	16 (20%)	2 (22%)	18 (20%)
Treatments			
Ongoing, <i>n</i> (%)	61 (76%)	6 (67%)	67 (75%)
Completed within previous 6 months, <i>n</i> (%)	19 (24%)	3 (33%)	22 (25%)
Line of therapy			
First line, <i>n</i> (%)	48 (60%)	2 (22%)	50 (56%)
Second line, <i>n</i> (%)	8 (10%)	3 (33%)	11 (12%)
Further lines, <i>n</i> (%)	5 (6%)	1 (11%)	6 (7%)
Completed, <i>n</i> (%)	19 (24%)	3 (33%)	22 (25%)

Abbreviation: CNS, central nervous system.

completed a medical history questionnaire. Patients who underwent autologous stem cell transplant were vaccinated 3–6 months after the treatment. The inclusion criteria had no upper age limit, as our pediatric oncology unit generally treats patients up to 25 or even 30 years of age, when these are affected by pediatric-type solid tumors. The following were reasons for exclusion: age <16 years; oncological treatments completed more than 6 months before enrollment; and specific allergic reactions to vaccine components. Patients with a history of severe allergic reactions (respiratory and/or cardiovascular involvement) to PEG or polysorbates (such as PEG-asparaginase) or other components of mRNA vaccines were considered to be at high risk of anaphylaxis and therefore could not receive the vaccine before having performed an allergy consultation; however, none of the patients within our series had previously manifested allergies to PEG-asparaginase.

Eighty-nine patients were enrolled for the vaccination program. Table 1 shows the patients' characteristics (age, gender, region of origin, educational qualification, type of tumor, treatment [ongoing or completed within the previous 6 months], line of therapy [first, second, others]). Of the 89 patients offered the vaccine, 80 (89.9%) accepted and received both doses at our unit, while nine (10.1%) refused to be vaccinated. As described in Table 1, the nine patients who refused had

a lower level of educational qualification as compared to patients who were vaccinated (only one patient had high school diploma and none university degree). Table 2 reports the characteristics of these patients, the level of educational qualification of parents (that was relatively low in most cases), and their reasons for refusing vaccination, that is, the fear of the vaccine's possible side effects, the disbelief regarding the pandemic, and the lack of confidence in scientific community. Some patients, especially those with multiple relapses, did not consider vaccination against SARS-CoV-2 very important. It is worth noting that two patients refusing vaccination had previously been infected with SARS-CoV-2.

3 | DISCUSSION

Various studies on adult patients have shown that people with cancer are at greater risk of complications and mortality from COVID-19: the 30-day mortality rate among hospitalized adult patients with COVID-19 and cancer has been reported as 30%, as opposed to 21% among non-oncological COVID-19 patients.^{8–11} Cancer patients frequently spend long hours in relatively safe but densely populated places, such

TABLE 2 Patients who refused vaccination and refusal reasoning

Patients	Age (years), gender	Educational qualification of patients	Educational qualification of parents	Tumor type	Treatment	Reasons for refusal
1	16 / F	Secondary school	Mother: secondary school Father: secondary school	CNS tumor	Completed	Fear for vaccine's side effects; disbelief regarding the pandemic
2	24 / M	Secondary school	Mother: secondary school Father: secondary school	CNS tumor	Second line	Vaccination not important
3	18 / M	Secondary school	Mother: secondary school Father: high school	Bone sarcoma	Completed	Fear for vaccine's side effects; disbelief regarding the pandemic
4	17 / F	Secondary school	Mother: high school Father: high school	Germ cell tumor	First line	Disbelief regarding the pandemic
5	16 / M	Secondary school	Mother: secondary school Father: high school	Soft tissue sarcoma	First line	Fear for vaccine's side effects
6	21 / M ^a	Secondary school	Mother: secondary school Father: secondary school	CNS tumor	Second line	Fear for vaccine's side effects
7	28 / M	Secondary school	Mother: high school Father: high school	CNS tumor	Second line	Fear for vaccine's side effects; disbelief regarding the pandemic
8	26 / M	High school diploma	Mother: high school Father: university degree	Lymphoma	Further line	Lack of confidence in scientific community; vaccination not important
9	23 / M ^a	Secondary school	Mother: secondary school Father: high school	Melanoma	Completed	Disbelief regarding the pandemic

Abbreviations: CNS, central nervous system; F, female; M, male.

^aPreviously been infected with SARS-CoV-2.

as hospitals and clinics, so they are theoretically more exposed to any nosocomial infection than people who can stay at home. The indirect harm caused by COVID-19 should also be considered, such as delayed cancer treatments if a patient becomes infected or has to quarantine. For these reasons, cancer patients are considered a high-priority subgroup for SARS-CoV-2 vaccination: vaccination should be considered a standard of care for all cancer patients receiving oncological treatments.¹²

Various studies found that relatively few pediatric cancer patients became severely ill with COVID-19, suggesting that the risks of infection related to their underlying disease and state of therapy-induced immunosuppression may be counterbalanced by the protective effect of young age.^{13–18} Vaccination nevertheless remains important for our patients. It is also crucially important to offer the vaccine to caregivers of cancer patients under 16 years old, an age group for which we still have no studies on the efficacy and safety of the vaccine. That said, although vaccination is recommended and actively offered to patients and caregivers, they are free to refuse.

To date, there are no official data available on adherence to the vaccination campaign against SARS-CoV-2 in Italy. At our institute, the rate of adherence was 88.7% (308/347) among doctors, but dropped to 80.8% (903/1117) among other health operators, and to 78.8%

(516/654) among non-health care personnel (unpublished data from the Fondazione IRCCS Istituto Nazionale dei Tumori, Milan, Italy). In the general population, it has been reported that the refusal rate for the Vaxzevria (AstraZeneca) vaccine was around 25%, peaking at 70% in the southern regions of Italy.¹⁹ The potential risk of a high rate of refusal prompts preoccupation among the Italian scientific community, as this may facilitate the circulation of the virus and dismiss the objective of reaching an adequate overall population immunity.

In our cohort of adolescent and young adult cancer patients, the refusal rate was rather lower than in the population at large, as about 10% of our patients refused the vaccine. A previous survey conducted on our young patients²⁰ showed that they were acutely aware of the risks associated with SARS-CoV-2 infection and its complications. This was probably related to their living with cancer disease, which had made them “grow up” faster than their peers. At the same time, their experience of life in hospital had probably taught them to place their trust in science and medicine, and especially in the doctors who were always by their side.

When we tried to understand the reasons why some people refused vaccination, misinformation very often appeared to be the primary culprit. It has been reported that at least in Italy, during the pandemic the media might have played an important role, often offering

contradictory and incomplete information that generated mistrust and confusion, for example reports emphasizing the adverse events associated to some vaccines.²¹ In our case series, patients who refused to be vaccinated were mainly from families with low levels of formal education. Their fear of the possible side effects of the vaccine outweighed their fear of the infection.

Overall, the number of patients adhering to our vaccination campaign has been satisfactory. Our results suggest that young patients with cancer may have a higher than average degree of maturity and a stronger perception of the risks of SARS-CoV-2 infection than the general adult population.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest to disclose.

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