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ORIGINAL ARTICLE

Knowledge and Attitude of Parents towards COVID-19 Vaccination Program for Children and Adolescents in Ipoh.

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Abstract

COVID-19 pandemic caused many deaths due to its high infectivity rate of transmission worldwide. Hence, COVID-19 vaccination program has been implemented which urges children aged above 5 years old to be vaccinated in order to curb the spread of disease and reach herd immunity. However, vaccine refusal or hesitancy among parents for their children pose huge challenges in achieving herd immunity and has put the unvaccinated children on edge which can be seen among Malaysian parents concerning over COVID-19 vaccine safety and efficacy for their children. The study was conducted to assess the knowledge and attitude of parents towards COVID-19 vaccination program for children and adolescents in Ipoh. A cross-sectional study was conducted involving 244 respondents (parents) in Ipoh through convenience sampling method. The data was collected through an online survey and in hard copy. The questionnaire consisted of three components. They were sociodemographic of respondents, knowledge, and attitude towards COVID-19 vaccination for children and adolescents. More than half of the respondents in this study were female (53.7%), with a mean age of 38.7± 6.8 years. Majority were diploma or certificate holders (39.8%), and their main occupations were not health-related (91.8%) with a monthly household income ranging from RM4850 – RM10959 (56.6%). The study showed that more than two-thirds of the respondents (70.1%, n = 171) have good levels of knowledge, while the rest of them (29.9%, n=73) have poor levels of knowledge towards children and adolescents COVID-19 vaccination. Majority of them (86.1%, n=210) showed that they had a good attitude level. The study depicted that there was a significant association between sociodemographic factors, particularly the household income, and the level of attitude towards children and adolescents COVID-19 vaccination. This study revealed that the level of knowledge of parents on COVID-19 vaccination for children and adolescents were not satisfactory as almost 30% of the respondents were still categorised as having poor level of knowledge. This called forth the health authorities to spread more information regarding COVID-19 vaccines by promoting its safety and benefits through all media platforms. The results also showed a significant positive correlation between the knowledge level and attitude toward COVID-19 vaccination for children and adolescents so it was believed that enhancement in knowledge level would improve the attitude of parents towards children and adolescents COVID-19 vaccination.

Keywords: *children and adolescents, COVID-19 vaccination, parents.*

Introduction

COVID-19 pandemic had caused many deaths and its' various strains, such as Omicron and, Delta, had increased the rate of transmissions. One of the key measures taken to reduce the burden of COVID-19 infections was implementing immunizations or vaccinations. "Vaccinations have been said to save millions of lives every year and are widely recognized as one of the world's most successful and cost-effective health interventions".[1] To ensure complete control of the COVID-19 infections, vaccination programmes among adults have been implemented worldwide. In order to achieve maximum coverage of vaccination and reach herd immunity against COVID-19 infections, children and adolescents are also suggested to be vaccinated.[2] Following the advice of the World Health Organization (WHO), some countries such as the United States of America (USA), Canada, and 14 other countries, had started to implement vaccination programmes for children ages 12 to 15 and received a satisfying response, as around 5 million children out of 28 million had been vaccinated at least one dose in the USA by the end of May 2022.

Malaysia started rolling out the vaccination programmes for adolescents for the primary two doses of COVID-19 vaccine, which was Pfizer, in 2021, and, according to Ministry of Health Malaysia, it received a positive response as the percentage of total adolescents vaccinated for one dose in 2022 was 96.5%, while the vaccination percentage for 2 doses was 93.4% for the whole country. Vaccination programmes for children in Malaysia aged 5 to 11 years old had been started from 3rd February 2022, and the percentage of children were being vaccinated for one dose was at 46.5% and the percentage for two doses was at 30.2% by May 2022. Nonetheless, vaccine hesitancy among parents for their children to be vaccinated against COVID-19 infections was becoming a major issue in Malaysia due to growing concerns over the vaccines safety for their children and many other factors. Even though all the vaccines had undergone many clinical trials and were declared safe by the Food and Drug Administration in the United States, Covid-19 vaccine hesitancy among parents still could not be erased.[3] According to the Strategic Advisory Group of Experts (SAGE) Working Group of vaccine hesitancy, vaccine hesitancy was defined as the delay in acceptance or refusal of vaccination despite the availability of vaccination services. This current issue was considered a worldwide health problem and provided huge challenges to reach herd immunity in the community, especially when a new variant such as Omicron was occurring, which had a higher rate of transmission.[3] According to one research done among parents in the USA, the results showed an increased level of COVID-19 vaccine hesitancy among parents for their children and had similarities with Malaysian parents who had taken the approach of "wait and see".[4] Even though Malaysian adult's vaccination rate was high and nearly reached 100%, the hesitancy of parents to give consent for their children's COVID-19 vaccination had led to a slow, progressed rate of vaccination among children and adolescents contrary to the target that had been set. Some of the factors that led to vaccine hesitancy were the adverse effects followed by immunizations, groundless and wrong information about the vaccine that were blatantly spread on social media platforms, and contents of the vaccine itself that had become a religious related issue.[5] There were many growing worries over COVID-19 safety for children and adolescents which may be the biggest factor of hesitancy for parents towards the vaccination programme for their children.[6]

With the increased number of COVID-19 cases among children and adolescents in Malaysia, COVID-19 vaccination had slowly been introduced to the adolescent that started early of July 2021, following the approval of vaccination for children of 5-11 years of age earlier this February 2022. Despite the success of adult vaccination in the country, child immunisation against COVID-19, especially in children below

the age of 12 years remained a challenge for health authorities. Many factors need to be assessed such as parents' knowledge regarding COVID-19 vaccinations for adolescents and children, fear of the safety of vaccines and its adverse effect, and the risk of the adolescents and children to be infected would leave an impression of the parents' acceptance toward the COVID-19 vaccination. Therefore, understanding parents' knowledge and attitude towards the COVID-19 vaccine would help give us an overview of their stand and acceptance of COVID-19 vaccination among children and adolescents.

Children being infected by COVID-19 due to their surrounding environment.

The hospitalization rates of children and adolescents under 18 years old being infected with COVID-19 had to increase to four times peak compared to Delta variant at a rate of 7.1 per 100,000 children and at rate of 1.8 per 100,000 respectively in early September 2021, with unvaccinated adolescents being the majority in number.[7] Although the symptoms might be mild, but it is still a worrisome problem among the parents. All industries, workplaces, malls and schools have now reopened to the public and have put the children in a susceptible zone especially with parents who work in the healthcare sector. According to a study done among doctors and nurses in China, 44.5% of them were willing to have their children below 18 years old to be vaccinated and the rest are willing to take COVID-19 vaccine only if the vaccines had shown high efficacy with longer duration of protection.[8] Due to the higher level of perceived threat, it was said that single parents, healthcare workers and those with history of past infection by COVID-19 were more willing to vaccinate their children.[9] Majority of parents agreed to have their children vaccinated only when it was proven to be effective in order to prevent being infected by COVID-19. In a survey conducted in Indonesia, about 93.3% of the participants wanted to take up COVID-19 vaccine that was 95% effective while only 67.7% would accept a 50% effective vaccine.[9] In schools with strict Standard Operating Procedure (SOP), the teachers are unable to manage large numbers of students to adhere with one metre apart of social distancing and wearing face masks all the time in class might be suffocating and annoying to them. Even at home, where the children who live with high-risk category, such as elderly, immunocompromised patient, pregnant women and occupational exposure to COVID-19, the preventive measures can only be addressed to their close contact.

Side effects of the vaccines and its benefits

According to Ministry of Health, as of mid-February 2022, Malaysia had reached 90.0% completion of two doses of COVID-19 vaccine among adolescents aged 12-17 years old since it was started last year, while children aged 5 to 11 years old had reached 19.9% fully vaccinated, which started in early February 2022, which accumulating the total population of Malaysia completed doses of about 78.8%. National COVID-19 Immunisation Programme (NIP) for adolescent and children required the consent of parents and it was not mandatory, although in media only display the good feedback from the perspective of parents, there were still number of parents unable to decide to take up the privilege of getting their child vaccinated due to many factors. The uncertainty might be concerning since the children were constantly being exposed to the virus wherever they went. From a survey conducted among the Malaysian parents (from August 2021 to October 2021), 93.2% were against to get their children COVID-19 vaccine due to uncertainty of the vaccines' content and 79.8% of them believed that vaccines were unsafe for the children with the additional reasons were due to their own bad experiences post vaccination and afraid of the children getting infected during vaccination.[10] All in all, the most common complications of Covid-19 vaccines for children and teens were headaches, tiredness, and pain in the arm at the site of injection. Some might experience a mild, brief fever which can be

treated with non-aspirin pain reliever and antipyretics as aspirin was not recommended for younger patients as they are at risk of developing Reye's syndrome. World Health Organization (WHO) recommends that children aged 5 years old and above can be safely administered the Comirnaty (Pfizer-BioNTech) vaccine with two standard doses of vaccine (30mcg) given at least 21 days apart especially children with comorbidities.[11] It is supported by CDC that reported by mid-October 2021, the hospitalization rate related COVID-19 reached about 8,300 cases of children aged 5 years old and up to 11 years old. As a matter of fact, COVID-19 has been ranked among the top 10 related cause of death in children and adolescent. [7] The Ministry of Health Malaysia also addressed the benefits of getting COVID-19 vaccine for children, as it can prevent them from developing serious conditions known as Multi System Inflammatory Syndrome in Children (MIS-C). This condition can mimic clinical presentation of Kawasaki Disease, Kawasaki Disease Shock syndrome and Toxic Shock Syndrome which include persistent fever, hypotension, gastrointestinal symptoms, rash, myocarditis and laboratory findings showing evidence of increased inflammation.[12] All the information regarding vaccination for children and adolescents has been positively promoted in many media platforms and there would be some unethical individuals manipulating the information without clinical based evidence. Parents are advised to get the true information from reliable sources and need to get consultation from the doctors first to check whether the children are eligible or not during pre-vaccination assessment (PVA).

Knowledge and attitude among parents regarding COVID-19 vaccination for their children

According to the Ministry of Health Malaysia, vaccinations for children and adolescents below 18 years old require parental consent. The caregiver should be well informed regarding the vaccination efficacy, safety, and possible adverse side effects, as they also need to sign a consent form agreeing to accept the vaccines. Parental knowledge is an important indicator in determining the childcare and consequently decisions for vaccination of their children. [13,14,15,16] Several studies have been conducted on this topic and the lack of knowledge was found to be the major determinant for parents' refusal or hesitancy of vaccination. [17,18,19,20] In a cross-sectional study done in Jakarta and Bandung, Indonesia via online survey, the average knowledge of the respondents scored 7 out of 9. The respondents from the educational background of university graduates and employed respondents were more knowledgeable on child's vaccinations.[21] A research was done to predict the attitude towards childhood immunization, and it showed that mothers were about more likely to have adequate knowledge and positive attitude towards childhood immunization compared to fathers.[22] The lack of knowledge regarding child vaccination was found to be associated with their social and demographic background, such as low educational level, poor household income, and poor socioeconomic standing.[23,24] A study showed that lower age group, females, higher education level were significantly associated with acceptance to COVID-19 vaccine.[25] In Saudi Arabia, willingness to accept the COVID-19 vaccine was relatively high among older age groups, married, higher education level, non-Saudi, and those employed in the government sector.[26] Parents who were employed, high education level and high household income were reported to have high knowledge scores which correlates to high practice scores regarding child immunization.[27] Parents with a lower educational level and a lower income in the families had lack of knowledge regarding vaccines due to poor access to the right source of information and consultation with health providers. Some studies conducted in Malaysia also showed that improving parents' knowledge regarding vaccines improves vaccination status and impacts the success of vaccination programs. [28,29,30] Based on a study conducted before,

parents' knowledge and attitude regarding children Covid-19 vaccination were 7.22 out of 9 point (80.2%) and 3.93 out of 4 points (98.3%) respectively.[31]

Social media networks are the main bridge information of COVID-19 vaccines

The refusal of vaccination has grown quite widespread among parents all around the world, which contributes to the increase in COVID-19 infection rates. The main cause of this attitude was doubts about vaccine safety, which was fostered by adverse experiences or the media.[32] When reviewing the history of vaccination in the United States and the United Kingdom, it showed how the media played a part in perpetuating fears of vaccination, despite clear and strong evidence of vaccine safety and efficacy.[33] Many scientific researchers had shown the negative impact of media controversies on vaccine uptake.[33,34,35] The Internet has provided a platform for anti-vaccination campaigners to spread their messages.[36] It was believed that the widespread availability of anti-vaccination content on the Internet contributed to a broader and faster dissemination of rumours, misconceptions, and false beliefs about vaccine which caused a toll on vaccine uptake.[37] In addition, with the existence of well-known social media platforms (such as Facebook, Twitter, YouTube or Wikipedia), that allowed users to share content and connect with the all the other users in the whole world, individuals were able to share their personal experiences of vaccination. All these narratives brought a personal and embodied perspective among parents toward COVID-19 vaccines, and their potential (often negative) consequences to health.[38] Indeed, studies analysing the vaccination-related content on the websites or social media networks, found that the information was of varying quality, with inaccurate or negative content being predominant.[37,39] Studies showed that individuals who delayed or refused vaccines were more likely to have looked for vaccine information on the Internet.[40, 41] The results of one experimental study done showed that surfing on an anti-vaccination website for mere 5–10 min had a negative influence on risk perceptions regarding vaccinations and on the decision to vaccinate one's child.[42] Misinformation and misleading vaccine-safety issues causes parents to be sceptical about vaccines being one of the most effective public health interventions. They instilled false beliefs that immunizations were unnecessary and that the risks outweigh the benefits.

Methodology

A cross-sectional study design was used for this study, and it was conducted within six weeks which was from 21st February 2022 to 4th March 2022 and then resumed on 4th July 2022 to 29th July 2022. The study population for this research were parents with children aged 5 to 17 years old and staying in Ipoh which includes Ampang, Anjung Tawas, Bandar Seri Botani, Bercham. Buntong, Canning Garden, Chemor, Cyber City, Falim, Greentown, Gugusan Manjoi, Gunung Lang, Gunung Rapat, Ipoh Garden, Jelapang, Keledang, Klebang, Lahat, Meru Jaya, Menglembu, Pasir Puteh, Pasir Pinji, Pekan Baru, Pekan Lama, Pengkalan, Silibin, Kampung Simee, Simpang Pulai, Station 18, Sunway City, Kampung Sungai Rokam, Tambun, Taman Cempaka, Taman Ipoh Jaya, Tanjung Rambutan, Tasek, Ulu Kinta. The total number of targeted parents was 351 100, which was obtained from the Department of Statistic Malaysia (DOSM) [43]. 244 sample size was obtained by using OpenEpi software with 80.2% of anticipated frequency [31]. By using the convenience sampling technique, the survey form was distributed through two ways which were hardcopy and softcopy. For the hardcopy survey form, the forms were distributed to the eligible parents who were residing near the house/hostels of the researchers and to the eligible staffs that were working at Universiti Kuala Lumpur Royal College of Medicine Perak. On the other hand, online survey form which consisted of the

questionnaire was distributed through social media platforms like Whatsapp application and Facebook. Once 246 respondents were obtained, data collection was stopped, and data analysis was begun.

Data collection Method and Data Analysis

The data collected through an online questionnaire which was adapted with slight modifications from previous research [10, 22]. The questionnaire consisted of three parts, Part A, Part B, and Part C. Part A consisted of 6 statements of demographic information of the respondents. Part B consisted of 10 statements regarding knowledge of child and adolescent COVID-19 vaccination while Part C consisted of 10 statements on the parent's attitude concerning child and adolescent COVID-19 vaccination. The level of knowledge had been categorized into "Good" and "Poor" according to its total scoring of 6-10 and 1-5 respectively. All questions in knowledge section from B1 to B10, the scoring was 1 mark given for answer option "True" and no marks given for answer option "False" and "Not sure". The level of attitude was categorised into "Good" attitude and "Poor" attitude based on the score obtained. Any score of 26 to 50 was considered as "Good" meanwhile a score of 1 to 25 was in "Poor" category. For questions C1 to C9, the score was given according to the answer which were 5 for "Strongly Agree", 4 for "Agree", 3 for "Neutral", 2 for "Disagree" and 1 for "Strongly Disagree". However, for the last question, the score was 1 for "Strongly Agree", 2 for "Agree", 3 for "Neutral", 4 for "Disagree" and 5 for "Strongly Disagree" respectively. An online informed consent was obtained from every respondent before the commencement of the study in accordance with the Declaration of Helsinki. The respondents' identity remained anonymous, however, general information which includes gender, age and education level were collected.

Microsoft Excel was used for the preliminary entry stage of data. Statistical analyses performed using the software package, Statistical Package for the Social Sciences (SPSS for Windows version 28.0). Both descriptive and inferential statistical analysis were performed in this study. The normality of the data was determined using histogram, Q-Q plot, box plot, and Shapiro Wilk test, where the knowledge and attitude scores were noted to be not normally distributed. The Chi-Square test was used to find out the association between socio-demographic factors and the level of knowledge and attitude. Spearman's correlation analysis test was conducted between the level of knowledge and attitude.

Ethical Considerations

Ethical approval (approval number: UniKLRCMP/MREC/2021-2022/SRP-239) from the Ethics Committee of Faculty of Medicine, Universiti Kuala Lumpur, Royal College of Medicine Perak, obtained on 23rd May 2022 of approval letter and a copy via email. The questionnaire was administered to the parents with children from 5 – 17 years old in Ipoh. Participation was made voluntarily, and informed consent was obtained from each respondent who answered the questionnaires via hard copy or soft copy. All identities and respondents' responses had been kept confidential from any public domain. Data were not revealed unless being told to do so by the respondent itself.

Results

Out of the 246 respondents received, 244 respondents were selected after data cleaning was done. The sociodemographic factors of the respondents were shown in Table 1.

Majority of the parents were mothers (53.7%), with a mean age of 38.7 ± 6.80 years. Most of them were diploma or certificate holders (39.8%), and non-healthcare workers (91.8%) with a monthly household income ranged from RM4850 – RM10959 (56.6%). Table 2 showed the percentage scoring of the parents' knowledge

towards children and adolescents COVID-19 vaccination questionnaire.

Table 3 summarised the level of knowledge of parents towards children and adolescents COVID-19 vaccinations.

Table 4 showed the percentage scoring of the parents' attitude towards children and adolescents COVID-19 vaccination questionnaire. Table 5 showed the level of parents' attitude towards children and adolescents COVID-19 vaccination.

Table 6 depicted the associations between the level of knowledge and socio-demographic factors of the parents on COVID-19 vaccinations for children and adolescents and there were no significant associations.

Table 7 showed the association between level of attitude and socio-demographic factors and there were no significant association except "household income" variable. There was a significant association between house income and level of attitude towards children and adolescents COVID-19 vaccination as the p value was less than 0.05 ($p<0.001$) with the prevalence odds ratio of 3.746. This showed that people whose have less income had nearly 4 times chance to have good attitude towards children and adolescent COVID-19 vaccination, compared with those who had high income.

Correlation between knowledge and attitude was interpreted using the following criteria: 0 – 0.25 = weak correlation, 0.26 – 0.50 = fair correlation, 0.51 – 0.75 = good correlation and greater than 0.75 = excellent correlation [44]. The correlation revealed significant positive linear correlations between knowledge-attitude ($r = 0.645$, $p<0.001$). The result reaffirmed the relationship between knowledge and attitude of parents towards COVID-19 vaccination program for children and adolescents as shown in Table 8.

Discussion

This study was conducted to evaluate the knowledge and attitude towards COVID-19 vaccination program for children and adolescents as well as to find out the relationship between parent's sociodemographic factors and their knowledge and attitude level. The study showed that more than half of the respondents had good knowledge on COVID-19 vaccine for children and adolescents which was in line with a study done among medical students in Malaysia.[45] The studies done by Universiti Sains Islam Malaysia (USIM) resulted opposite outcome, where more than half of the respondents had poor knowledge on COVID-19 vaccine [25]. The results in this study showed that majority of the participants had a good level of knowledge. However, male had a higher percentage (75.2%) of good knowledge on COVID-19 vaccines for children and adolescents than females (65.6%). However, a study done at Hulu Langat, Selangor showed that females had slightly higher knowledge regarding childhood vaccination as compared to males.[22] Despite that, the relationship between gender and knowledge on COVID-19 vaccine in this study appeared to be not statistically significant which was supported by the previous study.[46]

The results depicted that younger parent, who were aged 30 years old and below had the highest percentage (77.4%) in having a good level of knowledge compared to those in the other age groups. However, another study revealed that those with the age >45 years old had higher knowledge scores on COVID-19 vaccines compared to younger age groups.[47] Apart from that, the same study presented the same result as this current study, showing that age and knowledge on COVID-19 vaccine were not statistically significant.[47]

This study demonstrated that a parent's educational level was not statistically significant with the level of knowledge on COVID-19 vaccine for children and adolescents. On the other hand, previous studies done proved that

educational status and knowledge were statistically significant. [25, 46, 47] Although most of both non-health worker and health worker parents had good level of knowledge on COVID-19 vaccines for children and adolescents, health worker parents had a higher percentage (75.0%) compared to the non-health worker parents (69.6%). This was expected as we believed that health workers were more informed and had a better understanding on how vaccines work compared to those who were not working in the health sectors.

The percentage of parents with good knowledge on COVID-19 vaccine for children and adolescents was increased following the increasing number of household incomes as shown on Table 6. Parents who had a household income of RM4850 and above had the higher percentage (73.3%) in having good knowledge on COVID-19 vaccines in children and adolescents compared to those who have household income of less than RM4850 which was 64.8%. The similar findings could be seen from a study conducted by USIM and in Bangladesh. [25,46] Nevertheless, both studies showed a statistically significant relationship between household income and knowledge on COVID-19 vaccine which was not on the same page as the present study. [25,46]

In short, even though fathers, young parents, health workers and well-off parents had the highest percentage in having good knowledge in COVID-19 vaccinations for children and adolescents as compared to others in their respective categories, there was no statistically significant relationship between parent's gender, age, occupation field and monthly household income with their level of knowledge on COVID-19 vaccinations for children and adolescents.

Based on the result of the gender distribution, both genders have a similar number of respondents that has a good attitude. Furthermore, it was supported by the result of the Chi-square test which showed there was no association between gender and level of attitude towards COVID-19 vaccination for children and adolescents as the p-value was more than 0.05. This result might be due to both genders having been adequately and equally educated about the COVID-19 vaccinations for children and adolescents throughout the past 2 years. Parents could be more aware about the benefits of allowing their children to be vaccinated as our research was conducted after the majority of the adult's population in Malaysia had been vaccinated and showed a positive outcome which was lesser cases of COVID-19 with high severity risks.

Good attitude towards COVID-19 vaccination was seen in both genders of parents. In comparison, this result was different from the result of previous studies in Poland and China that showed women had more favourable attitudes toward their children getting COVID-19 vaccinations. Also, another study conducted in Jordan produced a different result which proved there was an association between gender and attitude as the p-value was less than 0.005 (p=0.012).[48] Our result was also different compared to a study that showed that fathers have higher attitude level towards COVID-19 vaccination than mothers.[49]

While for the age distribution, most of the respondents were from the 31-40 years age group which was more than half of the respondents and 87.4% of them had shown a good attitude. It might be due to high awareness of the vaccination programs for children which influenced their good attitude. The minority age group (51-60 years old) was recorded as 4.9% of all respondents, however, 91.7% of them showed a good attitude with only one person showing a poor attitude. This contrasted with another study which showed the result of respondents aged 40 years old and above were more concerned about the side effects of the vaccines hence the negative attitude towards COVID-19 vaccination for children.[50]

Our result for the age distribution was also different compared to the result from a study that concluded that sociodemographic factors influenced the parents including their age with a p-value of less than 0.05 (p=0.046).[48,49]

Overall, our research results showed that there was no association between age distribution and the attitude of parents towards COVID-19 vaccination for children and adolescents.

Many of the respondents had a good educational background as more than half of the total respondents had at least a certificate or diploma. Our result showed that there was no huge gap between the highest categories of educational background and the other lower categories aside from the no formal education making that educational background is not the conclusive predictor of the good attitude of parents towards vaccination. However, the highest category of the educational background still had the highest percentage of good attitude which may be due to wider access to better information about vaccinations causing them to have better tools to avoid believing all the rumours and theories that were circulating. In comparison to the other study done in Jordan, our research's result differed from theirs since their study had shown there was an association between the level of study and the attitude of parents towards COVID-19 vaccination for the children.[48]

However, in our research, the result showed there was no association between educational level and the level of parents' attitude towards children and adolescents with COVID-19 vaccination ($p=0.230$).

Next, for the occupational field, 87.1% which was the majority of the non-health worker parents showed a result of good attitude and for the healthcare worker parents, 75.5% of them had a good attitude result. The result showed no association between occupational field and level of attitude towards children and adolescents COVID-19 vaccination. Interestingly, a high percentage of healthcare workers' parents that had a good attitude was expected as they were more knowledgeable about COVID-19 vaccinations and witnessed the severe effects of various cases of COVID-19 during their work but in our result, a higher percentage of parents with good attitude was from the non-healthcare worker followed by the healthcare workers category. The reason for our result might be due to the limitation of having an unequal number of individuals in each category and high awareness towards vaccination among the non-healthcare worker parents.

This result for the occupational field was similar to the result of a study done in India and Poland which found that healthcare worker parents were not significantly associated with a positive attitude towards vaccination [56]. However, in another study done in China, the result showed the opposite finding which was the type of occupational field such as health workers parents had a significant association with the level of attitude of parents towards the COVID-19 vaccination.

Lastly, the majority of respondents from the three categories of household income scored a good attitude. In comparison between the two categories of household income, the highest percentage of respondents that scored good attitude came from the category of RM4850 and above followed by the other category. Therefore, there was a significant association between house income and level of attitude towards children and adolescents' COVID-19 vaccination. The reasons for the significant association might be due to higher household income better access towards health resources, better consultation with better doctors, and higher education level. This result was the same as the study conducted in Jordan which also showed there was an association between the level of income and the attitude of parents towards the COVID-19 vaccination for children and adolescents [47]. Another study was done in Italy also showed there was an association between level of income and attitude towards COVID-19 vaccination as the result concluded that parents with low-income levels have a negative attitude towards the vaccination. This study proved that there was a significant positive linear correlation between parent’s attitude and knowledge towards COVID-19 vaccination programs for children and adolescents as indicated in Table 8. This result was further supported with previous studies done in multiple different countries. [1,52 ,53, 54]

In our point of view, parents who had a better knowledge might understand the exact functions of the vaccine and were able to evaluate the pros and cons of COVID-19 vaccines for their children. Therefore, they could see that COVID-19 vaccines had more benefits than harm which could lead them to have a positive attitude towards the vaccination program.

Limitation

This study only involved parents who had children aged 5 to 17 years old and it caused challenging to find respondents that really fitted the criteria within the time allotted for data collection. Thus, by including respondents from other states in the study, there would be better opportunities of getting enough respondents and the result could be more representative.

Conclusions and recommendations

Despite the success of adult vaccination in Malaysia, with a rate nearly reaching 100%, child vaccination against COVID-19, particularly in children below the age of 12 years old remained a challenge for health authorities. The delay in acceptance or refusal of COVID-19 vaccination among parents for children requires serious attention especially with the emergence of new variants Omicron and Delta which was known to cause an increase in the rate of transmission of infection and caused the unvaccinated children's safety to be jeopardised. Assessing the knowledge and attitude of parents towards COVID-19 vaccination program for children and adolescents and their relationship with socio-demographic factors might help in public health interventions to get parents' approval and increase vaccination rate among children. From this study, it was seen that there were quite a few parents who were still lacking knowledge regarding COVID-19 vaccines for children and adolescents despite having good attitude towards it. The study also revealed that the household income greatly affected the attitude of parents towards COVID-19 vaccination, especially the lower household income. Thus, more implementation on health education and health promotion campaigns that could reach all classes of families, were highly recommended to increase the knowledge level of parents on COVID-19 vaccines for children and adolescents and as well as to further improve the attitude towards the vaccination program.

Table 1. Socio-demographic factors of parents in Ipoh

Variables	n	Percentage (%)
Gender		
Male	113	46.3
Female	131	53.7
Age		
Less than 30	31	12.7
31 – 40	127	52.0
41 – 50	74	30.3
51 – 60	12	5.0
Education level		
Secondary education and below	59	24.1
Certificate or Diploma	97	39.8
Bachelor's Degree and above	88	36.1
Occupational field		
Healthcare background	20	8.2
Non-healthcare background	224	91.8
Monthly household income		
Less than RM4850	91	37.3
RM4850 – RM10959	138	56.6
RM10960 and above	15	16.1

Table 2. Knowledge of parents towards children and adolescents COVID-19 vaccination questionnaire

Questions	True		False		Not sure	
	N = 244	N	(%)	N	(%)	N	(%)
B1. Children with certain underlying medical conditions are at a higher risk of getting severe COVID-19 infection including hospitalisation, ICU admission and death.		185	75.8	19	7.8	40	16.4
B2. COVID-19 can make children very sick and cause them to be hospitalized. Some complications from the infection can also lead to death.		192	78.7	9	3.7	43	17.6
B3. COVID-19 vaccination reduces the risk of hospitalization and death when children get infected with COVID-19.		172	70.5	14	5.7	58	23.8
B4. COVID-19 vaccine is more than 90% effective at preventing COVID-19 in children ages through 5-11 years old.		126	51.6	29	11.9	89	36.5
B5. Vaccinating children against COVID-19 can help to slow down the spread of COVID-19 in the community.		164	67.2	17	7.0	63	25.8
B6. There is no evidence that COVID-19 vaccines can cause fertility problems.		86	35.2	19	7.8	139	57.0
B7. A severe allergic reaction, like anaphylaxis, may happen after any vaccinations, including COVID-19 vaccinations, but this is rare.		131	53.7	26	10.7	87	35.7
B8. The common local reactions after getting vaccinations include pain at injection sites, redness and swelling.		192	78.7	32	13.1	20	8.2
B9. The common systemic reactions after getting vaccinations include fatigue, headache, muscle pain, chills and fever.		226	92.6	16	6.6	2	0.8
B10. COVID-19 vaccine should preferably not be given simultaneously with other vaccines to avoid confounding possible adverse events.		174	71.3	1	0.4	69	28.3

Table 3. Knowledge of parents towards children and adolescents COVID-19 vaccination

Variable	Category	Frequency	Percentage (%)
Knowledge of parents towards children and adolescents COVID-19 vaccination	Good	171	70.1
	Poor	73	29.9

Good knowledge: score 6-10; Poor knowledge: score 1-5

Table 4. Attitude of parents towards children and adolescents COVID-19 vaccination questionnaire

Questions	**Strongly Agree**		**Agree**		**Neutral**		**Disagree**		**Strongly Disagree**	
N = 244	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**
C1. COVID-19 vaccinations are safe for children.	30	12.3	108	44.3	78	32.0	22	9.0	6	2.5
C2. COVID-19 vaccine is essential for my child's/children's health.	31	12.7	118	48.4	65	26.6	29	11.9	1	0.4
C3. I am willing to allow my child to receive COVID-19 vaccines.	42	17.2	111	45.5	48	19.7	48	11.9	14	5.7
C4. I will advise others to receive the COVID-19 vaccines for their children.	20	8.2	81	33.2	109	44.7	30	12.3	4	1.6
C5. I believe that COVID-19 vaccinations should be made mandatory for children.	19	7.8	51	23.8	81	33.2	73	29.9	13	5.3
C6. I prefer my child to get immunity by getting COVID-19 vaccine rather than being infected by COVID-19.	49	20.1	115	47.1	52	21.3	27	11.1	1	0.4
C7. It is important for the health of others in the community that my child/children be vaccinated with COVID-19 vaccine.	44	18.0	94	38.5	66	27.0	33	13.5	7	2.9
C8. COVID-19 vaccination is highly effective in protecting my child/children from COVID-19.	27	11.1	111	45.5	61	25.0	40	16.4	5	2.0
C9. Do you believe that more public awareness is required about the COVID-19 vaccination among children and adolescents aged 5-18 years old?	53	21.7	127	52.0	48	19.7	15	6.1	1	0.4
C10. Do you think that new vaccines (like COVID-19 vaccine) bear more risks than older vaccines?	35	14.3	100	41.0	90	36.9	18	7.4	1	0.4

Table 5. Attitude of parents towards children and adolescents COVID-19 vaccination

Variable	Category	Frequency	Percentage (%)
Attitude of parents towards children and adolescents COVID-19 vaccination	Good	210	86.1
	Poor	34	13.9

Good attitude: score 26-50; Poor attitude: score 1-25

Table 6. Association between level of knowledge and socio-demographic factors

	Level of Knowledge					
N=244	Good N=171 (70.1%)	Poor N=73 (29.9%)	Chi-square value	df	POR	p-value
Gender						
Male	85(75.2%)	28(24.8%)	2.651	1	-	0.103
Female	86(65.6%)	45(34.4%)				
Age						
Less than 30	24(77.4%)	7(22.6%)				
31 – 40	85(66.9%)	42(33.1%)	1.620	3	-	0.655
41 – 50	53(71.6%)	21(28.4%)				
51 – 60	9(75.0%)	3(25.0%)				
Education level						
Secondary education and below	43(72.9%)	16(27.1%)	4.735	4	-	0.315
Certificate or Diploma	63(64.9%)	34(35.1%)				
Bachelor's Degree and above	65(71.6%)	23(28.4%)				
Occupational fields						
Non-healthcare background	156(69.6%)	68(30.4%)	0.251	1	-	0.616
Healthcare background	15(75.0%)	5(25.0%)				
Household income						
Less than RM4850	59(64.8%)	32(35.2%)	1.905	1	-	0.167
RM4850 and above	112(73.3%)	41(26.7%)				

Chi-square test was performed, level of significant at $p<0.05$
df = degree of freedom, POR = prevalence odds ratio

Table 7. Association between level of attitude and socio-demographic factors

	Level of Attitude					
N=244	Good N=210 (86.1%)	Poor N=34 (13.9%)	Chi-square value	df	POR	p-value
Gender						
Male	100(88.5%)	13(11.5%)	1.036	1	-	0.309
Female	110(84.0%)	21(16.0%)				
Age						
Less than 30	25(80.6%)	6(19.4%)				
31 – 40	111(87.4%)	16(12.6%)	1.316	3	-	0.725
41 – 50	63(85.1%)	11(14.9%)				
51 – 60	11(91.7%)	1(8.3%)				
Education level						
Secondary education	48(81.4%)	11(18.6%)	4.782	4	-	0.312
Certificate or Diploma	81(83.5%)	16(16.5%)				
Bachelor's Degree and above	81(91.4%)	7(8.6%)				
Occupational fields						
Non-healthcare background	195(87.1%)	29(12.9%)	2.224	1	-	0.136
Healthcare background	15(75.0%)	5(25.0%)				
Household income						
Less than RM4850	69(75.8%)	22(24.2%)	12.692	1	3.746	***<0.001***
RM4850 and above	141(92.2%)	12(7.8%)				

Chi-square test was performed, level of significant at p<0.05
df = degree of freedom, POR = prevalence odds ratio

Table 8. Correlation between level of knowledge and attitude of the parents on COVID-19 vaccinations for children and adolescents

Variable	Correlation	R	p-value
Level of knowledge – attitude correlation	Spearman's rho	0.645	<0.001

Significance value p <0.01. R: correlation coefficient.

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