
Childhood Vaccines Information Sources Reliability and Vaccination Status*

Lady Alexis Jin R. Aduca, Casser John D. Aguinaldo, Michael Angelo Avila, , Ryan Ali Y. Banjal, Relyn Joy C. Bartolome, Aaron Christopher C. Braganza, Shaira Faith M. Consista, Kristian Oliver S. Cruz, Augustine John A. Cui, Paul Laurence A. Del Rosario, Michaela Marie C. Dizon, Carla Justine R. Egargo, Sandra Fe M. Esguerra, Alexandra Mae Q. Espineda, Isabelle Joy M. Faral, Marvile Rea R. Ferrer, Karen Mae F. Fiedacan, Pamela D. Garcia, Kym V. Gonzales, Michael John P. Kuizon, Jerzeth Kate A. Labao, Ma. Kristina Carla B. Lagman, Cleo Thea V. Laydia, Jhan Rose Liu, Djoeth Paula T. Macomb, Laila Noreen R. Magnaye, Rochelle D. Maligalig, Precious Neza M. Mapusao, Christopher Matthew B. Mendoza, Danielle Allyson O. Miranda

ABSTRACT

Background: Vaccination is one of the most important advances in medicine. Over the past years, it has prevented diseases that before would be fatal and can even cause death. Since then, vaccination has been a regular part in preventing diseases, specifically those administered during childhood. However, recently, there has been a decline in vaccine coverage areas causing outbreaks of preventable diseases. Research has shown that because of the numerous information sources especially the Internet and social media that people can obtain, misconception about vaccination occurs causing parents to refuse immunizing their children.

Objective: This study aimed to identify the sources of vaccine information among parents. It also aimed to determine reliability of parental childhood vaccine information with the World Health Organization (WHO) or Department of Health (DOH) immunization criteria, and lastly, it aimed to determine the effect of vaccine information sources and reliability on vaccination status of the children.

Methodology: The researchers used an analytic cross-sectional design to identify the objectives. The study was conducted in Quezon City, Philippines, and participants were Filipino mothers over the age of 18 years old with at least one child at two and a half years old or below.

Results: Out of 385 respondents of the survey questionnaire, 129 (33%) were validated and included in the analysis. For the sources of information, 71% of the respondents were reported to be using 1 to 3 sources of information on childhood vaccines, with family and friends as the leading source. Also, more than half (58.9%) of the respondents were reported to have inadequate reliable sources of information. With regards to immunization status, more than half (51.94%) of the children have updated immunization status but almost half (48.06%) were not. Determination of prevalence odds ratio (3.074) between information content reliability and immunization status showed that the majority of respondents have inadequate reliability of information regarding childhood vaccines.

Conclusion: It was shown in this study that the childhood vaccination information obtained by most of the respondents were insufficient. With these findings, the authors concluded that the reliability of the sources of childhood vaccine information affects the immunization status of the children.

Key words: Vaccination, preventable diseases

* From Group 1, Section 3A, Department of Community and Family Medicine, School of Medicine

Vaccination is described by the World Health Organization (WHO) as a safe and effective way to prevent diseases. Through vaccination, children can develop immunity without actually suffering from the diseases. However, there are lots of myths and misconceptions about vaccination that cause parents to refuse the vaccination of their children. A reduction in incidence for many vaccine preventable diseases is seen worldwide due to higher coverage areas. In the Philippines however, a decline in vaccine coverage areas was seen starting in the year 2017 till today.^{1,2} Vaccine refusal rates have increased.² Additionally, vaccine refusal risks are often clustered geographically, which has been associated with outbreaks of vaccine preventable diseases due to misinformation.³ Ideally, the most common sources of vaccine information are the primary healthcare providers but research has shown that parents obtain vaccine information from a number of other sources as well.⁴

The source of vaccine information can have an impact on the manner and frequency of its use. Sources of information may have different credibility depending on the characteristics of a population; credibility can have a great impact on the acceptance of information, and how the information can have an effect on the vaccination status of children.^{4,5} A variety of sources of information run on a spectrum from traditional sources such as public health officials, physicians, celebrities and different advocacy groups. The internet has become a widely used source of information including vaccine information.⁶ Nowadays, the use of the internet to seek information on vaccines is common and as the content of the information gets rapidly updated, it not only increases the internet-based information but it also makes it impossible to regulate the information that parents read regarding vaccine information. Methods of vaccine information dissemination have become more varied through public announcement through physician-patient discussion and newer media routes such as websites, blogs and television programs.⁴ It is unknown on how Filipinos evaluate sources' credibility about childhood vaccines, and which modes of information dissemination are often used. Additionally, the characteristics of health information that influence vaccine refusal are still unknown.

It is important to identify the sources of vaccine information along with it, the importance of

determining the credibility of the vaccine information to have a clearer picture of how this vaccine information can have an effect on vaccination status of Filipino children. Thus, the findings of the study may help contribute to improving existing health programs regarding vaccine information dissemination or may help formulate more sustainable and effective programs in the future to stop the declining trend of coverage areas for vaccine preventable diseases.

The objectives were to identify the sources of vaccine information among parents and determine reliability of parental childhood vaccine information and the effect of vaccine information sources and reliability on vaccination status of the children.

Review of Related Literature

Childhood Vaccines and its Sources

One of the most cost-effective public health interventions is immunization. It prevents deaths every year from diphtheria, tetanus, pertussis, and measles. In 1974, the World Health Organization established the Expanded Program on Immunization (EPI) in order to reduce morbidity and mortality by these diseases. The program targets vaccine-preventable diseases such as diphtheria, pertussis, tetanus, measles, poliomyelitis, tuberculosis, hepatitis B, *Streptococcus pneumoniae* and Hib infections. The EPI includes policies on evidence-based recommended vaccine schedules. These contain the age at which the child is most vulnerable to the disease and at which the vaccine can be given safely.

A study conducted by Kagone, et al.⁷ reported that most of the informants are knowledgeable about vaccination and the benefits they hold in protecting the child from deadly diseases. However, the problem lies in mothers not knowing the EPI program itself, including the vaccination schedules and their different appointments. This study has provided evidence about the importance of considering the barriers to the uptake of immunization. Proper information dissemination is one of the important key factors in vaccine compliance.

In terms of information dissemination especially on health related topics, the internet has been a huge part of it. It has already been easily accessible especially with the advancements of technology. It is where parents seek and share information, including about vaccination. This has been helpful in terms of spreading knowledge and awareness in a larger

audience but the downside is its being unregulated. Thus, the source of information gathered would still be very crucial and bear a great impact on how the people would accept and the degree to which it is acted upon. A study conducted by Tustin, et al.⁸ revealed that the Internet has significantly affected Canadian parents' negative perception of vaccine risk. It was suggested that the government and health sector should consider the development and implementation of web-based vaccine interventions in order to promote confidence in immunization. The internet has been an important vehicle for individuals seeking health information, thus, it must be utilized well. However, despite the numerous sources, the most commonly used sources would be from the child's healthcare provider.⁴ These results are consistent with previous studies in which investigators have found pediatric providers as the most frequent.⁸ Even though the majority considered their children's pediatrician as the most trusted source of vaccine information, there is still a significant number of parents who place less trust on their healthcare providers and tend to search for additional vaccine information from different sources which include the internet, family friends, and government agencies.⁹ Parallel to that, results from a study done in 2020 revealed that the three main vaccine information sources were: healthcare professionals, the internet, and relatives. It was also noted here that vaccination practices and acceptance were better when parents were getting information from HCPs compared with parents getting information from the internet or relatives.¹⁰

Vaccines Required for Infants and Children

The government takes a proactive role in the protection and promotion of health of infants and children as stipulated in Republic Act No. 10152 also known as the "Mandatory Infants and Children Health Immunization Act". It seeks to provide mandatory basic immunization services for infants and children and identifies the roles of the state to inform and educate the public as well as health care practitioners on the importance of immunization and the existing vaccine-preventable diseases. Section 3 requires that basic immunization shall be given free for all infants and children up to five (5) years of age at any government hospital covering the following diseases: a) Tuberculosis; b) Diphtheria, tetanus and pertussis; c) Poliomyelitis; d) Measles; e) Mumps; f) Rubella or German measles; g) Hepatitis-B; h) H.

Influenzae type B (HIB); and i) Such other types as may be determined by the Secretary of Health in a department circular.

Vaccine Confidence in the Philippines

A year after the Dengvaxia controversy, vaccine confidence in the Philippines sharply declined from 2015 in which 93% were "strongly agreeing" that obtaining vaccines is important to only 32% in 2018.¹¹ In addition, vaccine confidence is specified as the trust in the vaccine (the product), trust in the vaccinator/ health professional (the provider), and trust in decision-makers (policy-maker).¹¹ This only implies that the public is dependent on the competence of DOH to recommend vaccines properly, to the companies that were providing vaccinations to be safe and effective, and for the health care professionals to administer the vaccines safely.¹²

Moreover, Mendoza, et al.¹² mentioned that the confidence on these components were greatly affected due to the Dengvaxia scare which resulted in the refusal of parents to have their child undergo mandatory immunization (e.g. measles vaccine). As a result, multiple outbreaks were reported in the different regions of the country. DOH also issued a statement that there is indeed loss of public trust and vaccine hesitancy due to the controversial Dengvaxia program. This hesitancy resulted to a measles outbreak based from the data collected by the Epidemiology Bureau of DOH which revealed that from 1 January to 9 February of 2019, a total of 4,302 measles cases have been reported, with 70 deaths.

Adverse Effects and Adverse Events of Vaccination

The study conducted by the American Academy of Family Physicians discussed the different adverse effects and adverse events that may occur for each type of vaccine. For vaccine adverse events, common local reactions to vaccines include pain, swelling, and erythema at the injection site. Systemic reactions, including fever, irritability, drowsiness, and rash, may also occur. Use of a longer needle (25 mm vs. 16 mm) decreases injection site reactions. The fourth dose of the diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine is associated with an increased incidence of fever and injection site reactions compared with the first dose (one in four children). One out of 30 children reports up to

seven days of swelling of the entire thigh or upper arm after the fourth or fifth dose. Syncope may occur especially in adolescents after administration of the human papillomavirus (HPV) vaccine; quadrivalent meningococcal conjugate vaccine (MCV4); or tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine. Because of this, adolescents should be observed for 15 minutes after receiving these vaccines. Administration of acetaminophen at the time of vaccination or shortly afterward may alleviate some adverse effects, but there may be a decreased antibody response to some vaccine antigens in children who receive antipyretics. For this reason and because antipyretics do not prevent febrile seizures, the Centers for Disease Control and Prevention (CDC) no longer recommends routine prophylaxis before vaccination.

Here are the serious adverse effects of different vaccines according to the study made by AAFP and this based in the CDC. 1) Diphtheria and tetanus toxoids and acellular pertussis (DTaP), a documented serious allergic reaction with an approx. rate of 1 per 1,000,000 doses; potential allergen is Infanrix syringe which contains latex. 2) Measles, mumps, and rubella (MMR) vaccine, adverse reaction is Immune thrombocytopenic purpura with approx. rate of 1 per 20,000 doses, the potential allergen is neomycin and gelatin. An article linking autism to the MMR vaccine was retracted for fraud, but this misinformation persists and has caused long-lasting public health consequences (Godlee et al. 2011). 3) MMR vaccine together with Varicella vaccine, an adverse effect which is febrile seizure was noted in 8.5 per 10,000 doses, the potential allergens are neomycin and gelatin. 4) Meningococcal vaccine is also associated with serious allergic reaction but is rare, Menomune and Bexsero that contain latex are the potential allergens. 5) Rotavirus can have an adverse effect of intussusception with rate of 1 per 20,000 to 100,000 doses, Rotarix contains latex in oral applicator of diluents is the potential allergen.

The rate of parental refusal of all or selective immunizations is increasing. The American Academy of Family Physicians (AAFP) does not support immunization exemption policies except in cases of allergic or medical contraindication. Physicians should continue to discuss the benefits of immunizations at subsequent visits because some parents may reconsider the decision not to vaccinate, and some simply postpone certain vaccinations. According to the research conducted by Shapiro,

Y. in 2016 at Touru College,¹³ it is still important to acknowledge the presence of fears, distrust, and other reasons to oppose vaccines. Although the adverse reactions are minimal, to the person who suffers an adverse event that is one too many. The Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDC) and American Academy of Pediatrics (AAP) all support vaccine administration, and have successfully reduced prevalence of vaccine preventable diseases. However, it must be ensured that appropriate education is disseminated to caregivers of children to protect the safety and lives of others by supporting vaccine administration so people with inability to receive vaccines will be better protected against vaccine preventable diseases. Ensuring a robust vaccination program, and supporting the expansion of research on vaccine preventable diseases can help develop vaccines for illnesses and diseases that currently remain untreatable. Perhaps new vaccine research might dispel vaccine myths and increase the rates of vaccination and protect more of the population.

Criteria on Credibility based on WHO

Despite the continuous success of immunization in reducing death from preventable diseases, certain groups still question the utility of vaccination. In recent years, the internet has been a huge part of information dissemination. It is where people seek and share information about almost anything, including vaccination. A number of websites provide unbalanced, misleading and alarming vaccine safety that can lead to undue fears among parents and patients. In 2003, WHO initiated the Vaccine Safety Net Project whose mission is to help internet users find reliable vaccine safety information tailored to their needs.

A key player in the project is the Global Advisory Committee on Vaccine Safety (GACVS). Their role is to respond promptly, efficiently, and with scientific rigour to vaccine safety issues of potential global importance. The committee developed three categories of criteria for good information practices – regarding credibility, content and accessibility/design to which sites providing information on vaccine safety should adhere. Websites are evaluated by WHO for their adherence to these criteria. Re-evaluations are done every two years to ensure that sites continuously meet credibility and content criteria.¹⁴

According to the GACVS criteria, the website should have a public health focus. Member registration may be required, however, registration and information should be free of charge. The website should contain information about the safety of vaccines mentioned on the site. It should be derived from evidence-based information. The website must provide balanced information on vaccine safety. The Vaccine Safety Net defines balanced as unbiased information that presents all reasonable sides of controversial issues fairly. Lastly, the website should be professional, clearly written and structured, and follow a logical hierarchy for ease of navigation.

GACVS listed two exclusion criteria in which websites are not eligible to join the VSN. These include corporate websites and websites that have no updates for 2 years and above despite availability of new information.

DOH Expanded Program on Immunization

In 1974, the World Health Organization (WHO) established the Expanded Program on Immunization to provide protection against six vaccine-preventable diseases through routine infant immunization.¹⁵ However, health system weaknesses including lack of public and governmental awareness of the scope and seriousness of the target diseases, ineffective program management, inadequate equipment and knowledge for vaccine storage and handling as well as lack of program monitoring have prevented universal access to vaccination and are a limitation for sustainable use of the increasing array of new vaccines.¹⁶ Fortunately, several solutions and strategies have been implemented to achieve the goal of universal access to the vaccines.

In the Philippines, WHO recommendation regarding immunization is being followed. Vaccination should be started 6 weeks after the first dose at birth. For BCG and Hepatitis B, it should be given right after birth. Pentavalent vaccines should be given together with oral polio vaccine and rotavirus. Before the child turns into 1 year of age, he/she should have completed 3 doses of Hepatitis B (or 4 doses if they have also received the infant dose at birth), 3 doses of DPT, 3 doses of Hib, 3 doses of polio, 3 doses of PCV, Rotavirus series and Influenza vaccine given at 6 months.

The Immunization Program of DOH only covers up to the 1st year of age. The succeeding recommended vaccines can be obtained from private institutions or other DOH programs.

Accessibility and Availability of Immunization program

The benefits of vaccination are clearly demonstrated by the eradication or enormous decline in the incidence of many vaccine-preventable diseases, but the coverage of many highly recommended vaccines is still frequently inadequate and children continue to suffer from diseases that could have been prevented. The problem is paradoxically significantly more evident in children at risk of infectious disease-related complications, but can also be found in otherwise healthy children, at least in the case of some vaccines.

Some of the most obvious barriers are factors affecting the supply and distribution of vaccines. Vaccine shortages due to a lack of manufacturing capacity are relatively common, and there have been a number of recent reports concerning late or inadequate supplies of influenza, tetanus, heptavalent pneumococcal conjugate (PCV7) and measles/mumps/rubella (MMR) vaccines, particularly in the USA. The administration of vaccines may be delayed during times of shortages at the time of a child's visit, but appropriate reminder/recall (RR) systems should be prepared to ensure that all children receive the right number of vaccine doses when the vaccine is once again available. These systems are not fully developed or really effective in many countries and, in some cases, providers themselves negatively interfere with their use. Although the USA has had an immunization information system since 1997, only 82% of the children aged <6 years who had received at least one vaccination were entered in it.¹⁷

Vaccine Status During Covid 19 Pandemic

According to the World Health Organization (WHO) and UNICEF, there has been an alarming decline in children who are receiving vaccines around the world since the COVID-19 pandemic has started. These disruptions may halt the progress that has been made in reaching more children and adolescents with a range of life-saving vaccines. Approximately 80 million children could be susceptible to vaccine-preventable diseases due to the decrease in immunization during the pandemic which could be a stark reminder that a public health crisis was also brought about by an interruption in vaccination services during the 2013-2016 Ebola epidemic in West Africa.

Vaccination campaigns have been reported to be cancelled or at risk of cancellation due to various COVID-19 related disruptions in immunization programs. Some of these factors include reluctance of parents to leave home at the risk of exposing their children, transport interruptions, economic hardships such as rising unemployment rates, and restrictions on movements. Moreover, health workers are also unable to reach and provide children through these campaigns due to restrictions on travel or reassignment to COVID response duties as well as the lack of protective equipment. With all these challenges, UNICEF has stated that the current pandemic has made routine vaccination a daunting challenge.

In 2020, recommendations on vaccine administration were published by the WHO and the Pan American Health Organization. Measures such as holding vaccination campaigns in places where essential health services had enough human resources and preserved vaccines, observing social distancing, and other minimum health standards may be put in place. Other innovative measures may also be instituted such as providing vaccines in vehicles, homes, or assigned rooms which are properly separated from areas commonly used for other clinic visits. Moreover, patient identification for the purpose of determining absentees as well as recruits may be monitored through the use of electronic immunization registries.

MATERIALS AND METHODS

Research Design

The study used the analytic cross-sectional design to identify the relationship/ effect of childhood vaccine information sources and reliability on the vaccination status of children.

Target Population

The study population had Filipino parents over the age of 18 years old with at least one child at 2 and a half years old or below.

Sampling Population

The sampling population are parents, in Quezon City, who acquire vaccine-related information through various media sources. These parents use the information they obtain from these sources to make decisions regarding their children's vaccination.

Eligibility Criteria

A. Inclusion Criteria

1. At least 18 years of age
2. Filipino
3. Parent of at least one child with ages 2 and a half years old and below.

B. Exclusion Criteria

Parents may be excluded from the study if any of the following criteria are present:

1. He/ She doesn't know how to read and write
2. He/ She doesn't speak and understand Filipino or English
3. He/She is incapable to participate in the study due to an illness or disability

Study Procedure

Those who expressed willingness to participate in this study were recruited by means of online platforms and also by asking people around the community. Interested participants were asked to comment or react to the post by the researchers. Interested people around the community were contacted by the researchers. They were also encouraged to invite the nearby residents in their community to join the study. The researchers then asked questions pertaining to the inclusion and exclusion criteria and explained the gist of the research. They then asked the participants to answer the survey questionnaire. After obtaining a signed consent form the authors grouped them into those who have their child taken the vaccine and not taken the vaccine. Data were collected in the form of questionnaires through google forms.

The information from the source was deemed as credible if they scored at least 15 out of 21, or if the score is greater than 70%. A score less than 70% is not reliable. Prevalence Odds Ratio was used for testing relationships between the sources and reliability, and the vaccination status of their children.

RESULTS

Of the 385 total respondents of the study, 129 (33%) respondents were validated and included in the analysis. The majority of the respondents (n=71,

55.0%) reported having one child, followed by two children (n=37, 28.7%), three children (n=14, 10.9%) and few respondents with greater than 3 children (n=7, 5.4%).

For the sources of information, the majority of respondents (n=91, 71.1%) reported using between 1 and 3 sources of information on childhood vaccines. As seen on Figure 1, most commonly used sources of childhood vaccine information was through their family and friends, followed by medical doctors and nurses. Among the leading sources of childhood

vaccine information are social media (Facebook) and television.

Figure 2 shows the proportion of reliability of contents from various sources of childhood vaccine information. Out of the 129 valid responses, more than half (n=76, 58.9%) scored 14 and below which depicts an inadequate reliability of the source of childhood vaccine information. Those who scored 15 and above (n=53, 41.1%), are those whose sources of information fall under reliable contents of childhood vaccination.

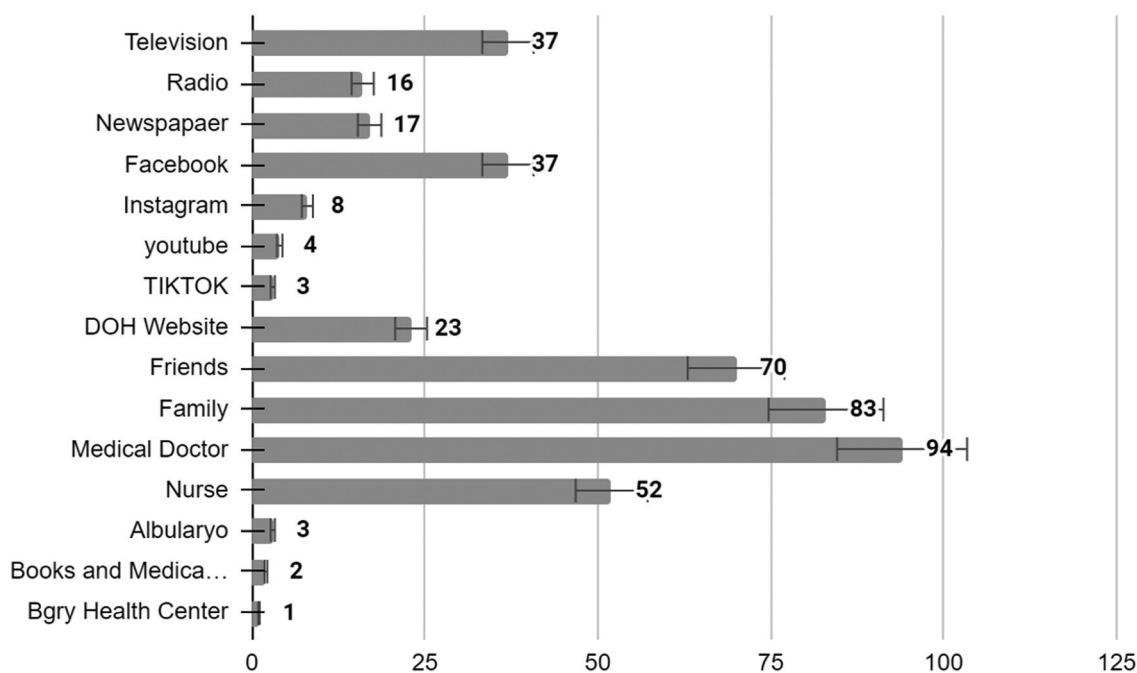


Figure 1. Sources of childhood vaccine information

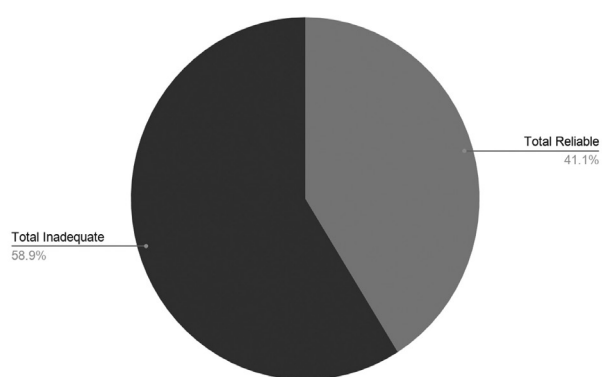


Figure 2. Information content reliability.

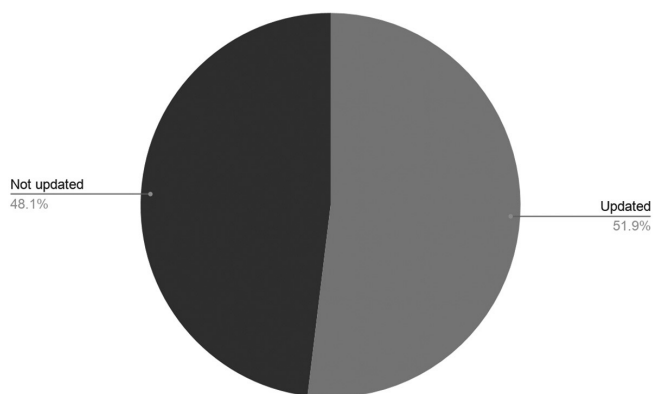


Figure 3. Immunization status of children

Figure 3 shows the proportion of children with updated immunization and not updated immunization status. Out of the 129 valid responses, the results showed that more than half of the children were updated with their immunization (n=67, 51.94%), while the rest (n=62, 48.06%) were not.

Based on the result of the survey with 129 validated respondents from 385 total respondents, 67 respondents were updated in their immunization while 62 were not. There were a total of 7 vaccines used to determine if the childhood vaccination were updated or not namely, BCG, DTP, Hepatitis B Vaccine, MMR/ Measles, Pneumococcal Vaccines, Oral Polio Vaccine, and Rotavirus.

The children's immunization status was categorized using the childhood immunization schedule released by the Department of Health that shows the different vaccine/s needed depending on the child's age. If a respondent has more than one child, at least one child should have an updated immunization to be categorized as having updated immunization.

At birth, a child should get both the BCG and Hepatitis B vaccine. For the first and second months of life, the child should get DTP, oral polio, pneumococcal, and rotavirus vaccines. The rotavirus can be given up until the 8th month of life. At the age of three and a half months, the child is already expected to have completed most of the necessary vaccines namely: Pentavalent Vaccine (3rd dose), Oral Polio Vaccine (3rd dose), Pneumococcal Conjugate Vaccine (3rd dose), and Inactivated Polio Vaccine (1st dose). At 9 months, the child is already scheduled to have his or her 1 out of 2 doses of Measles, Mumps, Rubella (MMR). After 3 months, when the child reaches 1 year old, all 7 sets of vaccines mentioned including the last dose for MMR should have already been given to the child.

Any child who has never undergone any immunization needed for their age or had undergone immunization but wasn't able to complete all the immunization recommended for their present age were categorized as not having an updated immunizations.

Prevalence odds ratio between Information Content Reliability and Immunization Status of the respondents were determined. The result shows that the majority of the respondents are categorized under parents with inadequate reliable information regarding childhood vaccines and have children without updated immunization status. The calculated odds ratio is 3.074.

DISCUSSION

The present study examined the relationship of childhood vaccination information sources of parents, its reliability on the vaccination status of their children, through an analytic cross-sectional design used for the assessment of respondents of self reported questionnaires. Among the target population, the most common sources of information were family and friends, followed by medical doctors and nurses. Additionally, social media and television were among the leading sources of childhood immunization information. A significant proportion of the sources of information comes from social media platforms such as facebook, which have significant amount of unreliable information. Fortunately, a vast majority of the respondents' sources of information were from their doctors and medical practitioners.

Results from Information content reliability showed that more than half of the respondents, which is about 58.9%, showed inadequate reliability of information regarding childhood vaccinations. Respondents' sources of information were social media platforms which admittedly offer difficulty in distinguishing facts from myths and opinions regarding the childhood vaccination. Higher percentages of unreliability of information may pose more harm than good to individuals. About 41.1% of the respondents showed adequate reliability of information regarding child vaccinations. These individuals' sources of information were medical practitioners such as doctors, nurses, etc. The best information regarding vaccines are those expertise within the medical field

Table 1. Prevalence-odd ratio between information content reliability and immunization status

	Child with Updated immunization	Child without updated immunization
Reliable information	36	17
Inadequate reliability of information	31	45
Odds Ratio:	3.074003795	

such as doctors as these information from the medical professionals are backed by research and scientific studies.

The results showed that more than half of the respondents have updated vaccinations that are under the Department of Health's national immunization program. However, many children have not yet updated their immunizations. This could be due to a higher proportion of inadequate reliability of the source of the childhood vaccine information. Inadequate information may be the reason why some parents do not have their children vaccinated even though the vaccines are provided by the government. Another reason could be the misconceptions about vaccines. Some parents believe that vaccines are not beneficial to their children, others believe that vaccines are harmful and may cause diseases such as autism. The simplest reason could be a lack of supply of vaccines. Vaccines have transportation requirements that make them difficult to transport, such as cold environments.

Limitations and Recommendations

The study was limited to the responses obtained from social media platforms due to constraints caused by the current pandemic. Additionally, since the questionnaire is freely accessible, responses were not controlled and some were invalidated since their data did not meet their inclusion criteria. This study was also limited by responses from caregivers and parents who have access to the internet and are familiar with how to navigate through the questionnaire.

The researchers recommend that future research should gather data on-site rather than online to make sure that the data to be collected, will come directly from the target population. This is ideal once COVID-19 pandemic is over and the quarantine protocols are lifted. It will also ensure that respondents from the different socioeconomic class can provide data in the absence of the internet. This will also avoid encountering technical difficulties due to poor internet connectivity. They also recommend to differentiate updated or not updated status for each vaccine to identify which one is the most updated and which one is the least updated in the population.

In summary, the study found out that the majority of the participants are more likely getting their information from unreliable sources such as the social media platforms which greatly affect the vaccination

rate of the children. Therefore, it is definite to claim that reliability of the sources of childhood vaccine information affects the immunization status of the children given the limitations of the study.

CONCLUSION

The authors conclude that the reliability of the sources of childhood vaccine information affects the immunization status of children. Most of the participants get their information from unreliable sources such as social media platforms like facebook. This greatly affects the vaccination rate of children thus social media platforms have a big responsibility in informing the public on right information about vaccines because it has real world effect as vaccines are needed to prevent from contracting serious diseases that are preventable. In addition, family and friends who provide information about vaccination should also ensure its accuracy and veracity in order to minimize other parents' and guardians' hesitancy in letting their children receive immunization.

Moreover, the study also showed that most of the respondents obtain insufficient childhood vaccination information. One of the primary sources of information of the respondents are healthcare workers such as nurses and medical doctors. Thus, it is important that they are able to establish proper communication with the parents and guardians to ensure that adequate and accurate information regarding childhood immunization is provided.

REFERENCES

1. UNICEF-WHO. UNICEF-WHO Philippines: Polio Outbreak Situation Report # 24. Accessed February 03, 2021. Available from: <https://reliefweb.int/report/philippines/unicef-who-philippines-polio-outbreak-situation-report-24-16-july-2020>
2. IFRC. Philippines: Measles Outbreak-Operation Update-Re-emergence of vaccine preventable diseases - Measles outbreak - DREF n MDRPH032. Accessed February 03, 2021. Available from: <https://reliefweb.int/report/philippines/philippines-measles-outbreak-operation-update-re-emergence-vaccine-preventable>
3. UNICEF-WHO (2019). UNICEF-WHO Philippines: Measles Outbreak Situation Report 10. Accessed February 03,2021. Available from: <https://reliefweb.int/report/philippines/unicef-who-philippines-measles-outbreak-situation-report-10-1-may-2019>
4. Jones A, Omer S, Bednarczyk R, Halsey N, Moulton L & Salmon D. Parents' source of vaccine information and impact on vaccine attitudes, beliefs, and non-medical exemptions. *Adv Prev Med* 2012. <https://doi.org/10.1155/2012/932741>

5. Valido EM, Laksanawati IS & Utarini A. Acceptability of the dengue vaccination among parents in urban poor communities of Quezon City, Philippines before and after vaccine suspension. *BMC Res Notes* 2018; 11: 661 . <https://doi.org/10.1186/s13104-018-3766-y>
6. Pradekso T, Manalou SR & Setyabudi D. Social media use and exposure to health related false information. *Proceedings of the 4th International Conference in Indonesia Social and Political Enquiries*. 2019.
7. Kagoné M, Yé M, Nébié E, et al. Community perception regarding childhood vaccinations and its implications for effectiveness: a qualitative study in rural Burkina Faso. *BMC Public Health* 2018; 18: 324. <https://doi.org/10.1186/s12889-018-5244-9>
8. Freed GL, Clark SJ, Butchart AT, Singer DC & Davis MM. Sources and perceived credibility of vaccine-safety information for parents. *Pediatrics* 2011; 127(Supplement). doi:10.1542/peds.2010-1722p
8. Tustin J, Crowcroft N, Gesink D, Johnson I, Keelan J. Internet exposure associated with Canadian parents' perception of risk on childhood immunization: Cross-sectional study. *JMIR Public Health Surveill* 2018; 4(1):e7.
9. Eller NM, Henrikson NB & Opel DJ. Vaccine information sources and parental trust in their child's health care provider. *Health Educ Behav* 2019; 46(3): 445-53. doi:10.1177/1090198118819716
10. Charron J, Gautier A & Jestin C. Influence of information sources on vaccine hesitancy and practices. *Médecine Et Maladies Infectieuses* 2020; 50(8): 727-33. doi:10.1016/j.medmal.2020.01.010
11. Larson, HJ, et al. Vaccine confidence plummets in the Philippines following dengue vaccine scare: Why it matters to pandemic preparedness. *Human Vaccines & Immunotherapeutics* 2018; 1–3., doi:10.1080/21645515.2018.1522468.
12. Mendoza RU, Valenzuela S, and Manuel D. A crisis of confidence: The case of dengvaxia in the Philippines. Available at SSRN: <https://ssrn.com/abstract=3519736> or <http://dx.doi.org/10.2139/ssrn.3519736>
13. Shapiro Y. Vaccinations: Weighing the risks and benefits. *Science J Lander Coll Arts Sci* 2016. Available from <https://touro scholar.touro.edu/sjlcas/>
14. World Health Organization. (2020). WHO Vaccine Safety Net. Retrieved February 2021, from World Health Organization: https://www.who.int/vaccine_safety/initiative/communication/network/vaccine_safety_websites/en/
15. Casey RM, Dumolard L, Danovaro-Holliday MC, et al. Global Routine Vaccination Coverage, 2015. *MMWR Morb Mortal Wkly Rep* 2016;65: 1270–3. DOI: <http://dx.doi.org/10.15585/mmwr.mm6545a5>
16. Cherian T, Mantel C. National immunization programmes. *Bundesgesundheitsbl* 2020; 63: 16–24. <https://doi.org/10.1007/s00103-019-03062-1>