

Opinion of Parents Regarding Conjugate Typhoid Vaccine

Hanif Memon¹, Farhan Saeed², Muhammad Iqbal³,
Muhammad Athar Khan⁴, Erum Saboohi⁵, Fatima Siraj⁶

Abstract

Objective: To study the opinion of parents regarding conjugate typhoid vaccine.

Methods: A total of 200 parents coming along with their kids for vaccination were serially enrolled for the study at the vaccination clinic. A cross sectional survey was done from 18th November to 30th November 2019. All parents attending the vaccination clinic with their children during the study period and who met inclusion criteria were consecutively enrolled. A structured self-administered questionnaire was used to collect information from the parents. Parents whose infants were aged between 9 months to 15 years and parents who gave informed consent were included in the study. Data were analysed using SPSS version 21.

Results: Majority of the respondents 181 (90.5%) had idea about the typhoid disease and 100 (50%) recognized the common complications of typhoid fever. Many of the respondents 150 (75%) answered "Yes" to question about knowledge of new typhoid conjugate vaccine. During the data collection, 60 (30%) of the attendees were of the opinion that Pakistan is the first country in the world to introduce this new typhoid conjugate vaccine. This study reveals gross favour 174 (87%) and positive perception about the beneficial effect of vaccine for children. Majority 145 (72.5%) of the respondents agreed to give vaccine to their children and 165 (82.5%) complied with booster dose. There was a high level 194 (97%) of support for it to be added in EPI program and also for recommending others to get it 177 (88.5%) among study participants.

vaccination, their awareness of the health benefits of vaccines, and the convenience of obtaining vaccines seem to be good. Our study showed encouraging opinion of majority of the parents visiting vaccination centre regarding new conjugate typhoid vaccine. Majority had clear understanding of typhoid illness and its prevention by vaccination. A small number of them (parents) had certain misunderstandings, fears and vague beliefs which were efficiently resolved by effective counselling regarding health education. Educational interventions are needed to improve parents' knowledge with special emphasis on less-educated residents of countryside place.

Keywords: Parents, typhoid fever, vaccination, child,

IRB: Approved by ethical review committee, Karachi Adventist Hospital. Dated; 16th November 2019.

Citation: Memon H, Saeed F, Iqbal M, Khan MA, Saboohi E, Siraj F. Opinion of Parents Regarding Conjugate Typhoid Vaccine [Online]. *Annals ASH KMDC* 2020;25:

(ASH & KMDC 25(3):144;2020)

Introduction

Enteric fever is characterized by fever with severe systemic illness and pain in abdomen, mainly

¹⁻³Department of Paediatrics,

Liaquat College of Medicine & Dentistry

⁴Department of Community Medicine,

Liaquat College of Medicine & Dentistry, Karachi

⁵Pediatric Consultant at Al-Tibri Medical College and Hospital

⁶Student Final Year MBBS,

Liaquat College of Medicine & Dentistry

Correspondence: Dr M. Hanif Memon

Department of Paediatrics

Liaquat College of Medicine & Dentistry

Email: mhmemon_9@hotmail.com

Date of Submission: 28th April 2020

Date of Acceptance: 17th November 2020

caused by *Salmonella enteric serotype Typhi* (formerly *S. Typhi*) and also by *S. enterica serotypes Paratyphi A, B, or C*¹. It is highly contagious in nature and is mostly caused by contaminated food, unboiled water and is more common in areas with infrequent hand washing practices and poor sanitation facilities. The contamination of water supplies with sewage is among the most common cause in developing countries. In many developing countries it remains endemic. Main presenting feature is high grade fever and other features include abdominal pain, headache, diarrhoea and vomiting *Salmonella* pathogen is mainly diagnosed by its isolation from

cultures of blood, bone marrow, stool and urine. The incidence of typhoid fever in developing world ranges from 100-1,000 cases per 100,000 population².

In order to avoid morbidity and mortality associated with enteric fever, it is better to have some preventive strategy. The most appropriate steps in its prevention is to drink safe, clean and boiled water, improvement of sanitary facilities, proper hand washing before meals and after defecation along with seeking medical advice in early course of illness. In developing countries, it seems difficult to achieve these effectively. For this reason, typhoid vaccine is recommended and besides this, complete protection against recurrent infection is not conferred by natural infection. Typhoid vaccination is an essential part in prevention and control of typhoid fever, recommended in epidemic and endemic situation of typhoid fever in public health programme³. At present, two licensed typhoid vaccines are commercially available. Ty21a is a live attenuated and administered orally while the Vi is a defined subunit virulence polysaccharide antigen and is administered parenterally⁴. Typhim Vi is recommended for children of age 2 years and older⁵. Both of these vaccines are well tolerated and efficacious⁶ but not recommended under 2 years because of poor protection⁷. Periodic repeated immunisation is required in case of risk exposure because none of these vaccines are 100 percent effective and their effectiveness declines over time so a more powerful vaccine is still needed. These vaccines are recommended at every 2 years for all young children in endemic areas for its prevention. Vaccination is also appropriate for individuals having a history of enteric fever or there is a risk of re-exposure even living in non-endemic areas. The most appropriate timing for vaccination following clinical disease is unknown.

Pakistan is the first country in the world and in South Asia, which has introduced typhoid conjugate vaccine (TCV) recommended by World Health Organization (WHO) to prevent children from typhoid fever between 9 months to 15 years of age and no

serious side effects were reported during vaccine campaign. This new conjugated vaccine in contrary to the previous vi polysaccharide vaccine can be given to children even from six months of age and onwards, against extensively drug-resistant (XDR) outbreak of typhoid. Since November 2016 more than 300 XDR typhoid cases reported in province of Sindh, Pakistan⁸. Typhoid vaccination can be economical if it targets the highest incidence age group in order to prevent typhoid fever⁹. A newly introduced, licensed Vi typhoid conjugate vaccines provide long term immunity than already available ones and is indicated even for use in young children. This vaccine is very safe and efficacious in children of 6 months of age and older. TCV is not associated with any severe side effects; however, common side effects like fever, pain at injection site, local reactions and diarrhoea among children following immunization are reported in some studies¹⁰.

The South Asian environment is conducive to the transmission of typhoid fever because of the rapid unplanned urbanisation, urban-rural disparities, poor access to improved water and sanitation facilities and the common practice of open defecation. The environment of south Asia is favourable for typhoid fever transmission because of open defecation practices, lack of access to clean water and sanitation, rural-urban discrepancies along with un-designed urbanization¹¹.

Introduction of typhoid conjugate vaccine is recommended in countries on priority basis with increasing cases of drug resistant typhoid fever. Due to lasting effect of this conjugate vaccine in younger children under 2 years of age it can be delivered through routine Expanded Programme of Immunisation (EPI) and results in prevention from typhoid fever and its complication from an early age.

The rationale of study is to overcome the hurdles in the prospect of children parents negative and positive view points to prevent typhoid fever through typhoid vaccination campaign as it is cost effective and safe method, in contrast to complication of disease and cost burden especially in case

of multidrug resistant (MDR) & Extended Drug Resistant (XDR) typhoid cases due to unnecessary (self-medication /over the counter) use of first line antibiotics for typhoid. The objective of this study was to study the opinion of parents regarding conjugate typhoid vaccine.

Subject and Methods

A cross sectional survey of 200 parents seen at the vaccination clinic of Karachi Adventist Hospital between 18th November to 30th November, 2019 was done. All parents attending the vaccination clinic of the hospital with their children during the study period; and who met inclusion criteria were consecutively enrolled. The sample size was calculated by Raosoft online calculator assuming 95% confidence level and margin of error 6.61%. Results from a previous study by Laharia et al. were also taken into consideration which showed awareness of typhoid vaccine in 64.2% pediatricians. The recommended sample size was 200. A structured self-administered questionnaire was used to collect information from the parents and in some of cases where the parents were illiterate, the questionnaire was administered to them by the investigators. Parents whose infants / children aged between 9 months to 15 years and parents whose informed consent were obtained are included in the study. Parents having children under 9 months and more than 15 years of age were excluded from the study. Data were analysed using SPSS version 21. Analysis of frequency and percentages of all categorical variables was done and represented in tables. The mean and standard deviations (SD) of all the numerical variables were calculated. Ethical approval for the study was sought from the Ethics Review Committee of the hospital. A written informed consent was sought from either parent accompanying the kids to the vaccination centre.

Results

Out of the 200 respondents, 100 were mothers, representing 50% of the total respondents, whereas 100 representing 50%, were fathers. Mothers'

ages ranged from 25 to 47 years, whereas fathers' ages ranged from 30 to 51 years. The mean ages were 35.1 ± 8.9 , and 39 ± 7 years respectively for mothers and fathers. Majority 91 (91%) mothers were housewives, whereas 68 (68%) fathers were working in public or private organizations. All the respondents (100%) were Muslims. Majority 82 (82%) mothers had matriculate and above education, whereas 90 (90%) fathers were matriculate and above. However, a few 16 (16%) mothers were illiterate as compared to only 18 (18%) fathers. Majority of the respondents 147 (73.5%) had three or more children whereas 47 (23.5%) had less than 3 children (Table 1).

Table 1. Demographic Characteristics of Study Population

Variable	Mother's Qualification n	Father's Qualification n
Graduation or more	53	65
Intermediate	10	9
Matriculation	19	16
Primary	2	1
Uneducated	16	9
# of Family Members	n	%
<3	47	23.5
3 or more	147	73.5
No response	6	3

Majority of the respondents 181 (90.5%) had idea about the typhoid disease and 100 (50%) recognizes about the common complications of typhoid fever. For instance, 74 (37%) remarked that, "they know about the antibiotics resistant strains" from social media and public awareness campaign. Many of the respondents 150 (75%) answered "Yes" to question about knowledge of new typhoid conjugate vaccine. However, most of them 157 (78.5%) had no idea about the cost of new vaccine. During the data collection, 60 (30%) of the attendees were of the opinion that Pakistan is the first country in the world to introduce this new typhoid conjugate vaccine. This study reveals gross favour 174 (87%) and positive perception about the beneficial effect of vaccine for children. Majority 145 (72.5%) of the respondents agreed to give vaccine to their children and 165 (82.5%) complied with booster dose. There was a high level 194 (97%) of

Table 2. Opinion of Parents Regarding Conjugate Typhoid Vaccine

Questions	Yes n (%)	No n (%)
Do you know what typhoid is?	181(90.5)	19(9.5)
Do you know about the complications of typhoid fever?	100(50)	100(50)
Do you know about the antibiotics resistant strains?	74(37)	126(63)
Do you know about the new conjugate vaccine?	150(75)	50(25)
Do you have an idea of cost of new conjugate vaccine?	43(21.5)	157(78.5)
Do you know Pakistan is the first country in the world to introduce this new vaccine?	60(30)	140(70)
Do you think it should be given to children?	145(72.5)	55(27.5)
Do you think it will be beneficial for your child?	174(87)	26(13)
Do you think it will lower infection rates?	173(86.5)	27(13.5)
Do you think it will prevent future infection?	171(85.5)	29(14.5)
Would you comply with a booster dose?	165(82.5)	35(17.5)
Would you support it if it added in EPI program?	194(97)	6(3)
Would you recommend others to get it?	177(88.5)	23(11.5)
Do you think it is harmful? (n=181)	44(24.3)	137(75.7)
Do you have family restrictions regarding this vaccine?	34(17)	166(83)
Do you think it contains family planning components?	10(5)	190(95)
Do you think it has religious or political aspects?	51(25.5)	149(74.5)
Do you think it is an international conspiracy against Pakistani children?	147(73.5)	53(26.5)
Do you think it may contain haram contents? (n=193)	22(11.4)	171(88.6)
Do you think it has side effects? (n=190)	122(64.2)	68(35.8)
Fever	107(86.3)	17(13.7)
Light headedness	33(34)	64(66)
Nausea, Vomiting	45(44.1)	57(55.9)
Fainting	39(40.1)	57(59.8)
Pain and swelling at injection site	84(73)	31(27)
Do you think the side effects subside? (n=177)	152(86)	25(14)
Is the child previously vaccinated? (n=196)	190(97)	6(3)
If yes, did they have any reaction?	41(21)	153(79)
Was the vaccine from: (n=193)		
Government Campaign	119(61.7)	--

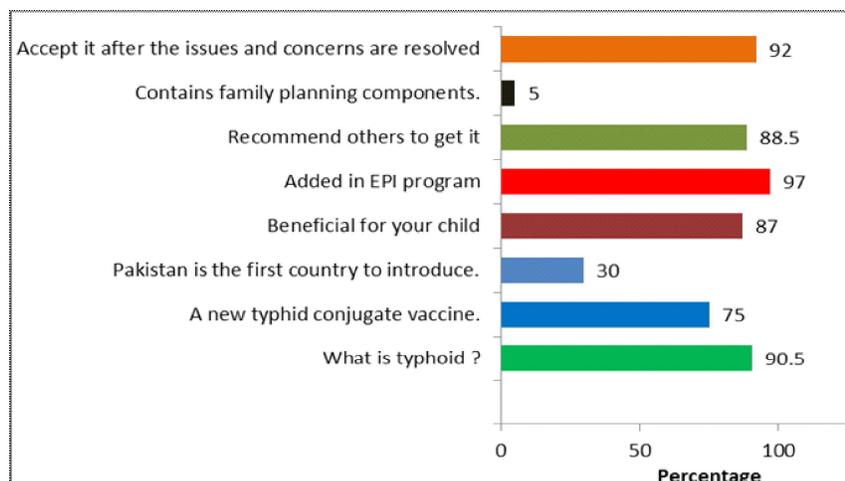


Fig 1. Main Positive Perceptions towards Conjugate Typhoid Vaccine

Privately
74(38.3)

–
Would you accept it after the issues and concerns are resolved?

184(92)

16(8) support for it to be added in EPI program and 177(88.5%) of the study participants were in favour of recommending others to get it. (Table 2).

In this study, 44 (22%) respondents held the belief that the new conjugate vaccine "is harmful" or "toxic" and only 10 (5%) think that it contains family planning component. Moreover, 147 (73.5%) respondents were initially of the belief that it is an international conspiracy against Pakistani children. However, majority 184 (92%) of the respondents accepted new conjugate vaccine after the issues and concerns were resolved (Figure 1).

Discussion

With recent advances in medical scientific knowledge children are more protected from various infectious illnesses and their complications by immunization. Vaccines are potent gears for prevention of infectious illnesses¹². Typhoid has been a long feared illness in our part of the world. Typhoid vaccination has unbolted many gates in prevention of this fatal infection which previously has taken many precious lives. Preventing Typhoid is crucial because its XDR strain is on the go. Our study has showed a diverse array of outcomes regarding parental concerns and opinion for typhoid vaccination. Parental involvement greatly enhances timely child vaccination¹³. In our study, majority of the literate parents vaccinated/agreed to vaccinate their children against typhoid.

Health literacy of mother is a major determinant of offspring well being¹⁴. Application of health information in taking decisions relating to healthcare and prevention of disease help improve quality of life. In our study, majority of the literate parents vaccinated their kids against typhoid (82%). This is in concordance with the study done in India by Mira Johri et.al where 72.4% of rural and 81.2% of urban literate parents get their child vaccinated against DTP¹⁵.

Older maternal age is usually associated with better vaccination coverage of her child/children because with maturity she can make better decisions

concerning healthcare. In our study, when we look at the parental demographics and family size; mean age of parents is above 30 years, an observation which is similar to what was seen in a study done in Turkey by SonerSertan Kara and colleagues in 2018¹⁶.

Higher educational level of parents positively goes along with their children's vaccination. Our study showed that parental educational status profoundly affects their child vaccination. Fifty three percent of mothers and 65% of fathers who brought their child for vaccination were having educational level graduation and above; an observation consistent with the study in Ethiopia by Ayele Mamo Abeb, Mesfin Wudu Kassaw, Alemu Birara Zemariam, and Nathan Estifanos Shewangashaw where 54.7% of the caregivers bringing their children for vaccination had secondary or above qualification¹⁷.

It has been a mindset in 3rd world countries that with large number of children in a family, compliance to vaccination get endangered. On the contrary, the encouraging finding was that 73.5% of the parents at the vaccination clinic had 3 or more children; similar observation was seen in a study done in Ethiopia by Abadi Girmay and Abel Fekadu Dadi where 59.5% participants had a family size of 5 or more¹⁸. This reflects positive approach relating to vaccinating all offspring.

Regarding parental knowledge about typhoid disease, 90% of the participants had some idea about typhoid, a finding consistent with the finding in a study conducted in Multan by Muhammad Imran Qadir and Mahnoor Ilyas in 2019. in which they studied the awareness about typhoid disease among people¹⁹.

Enteric fever has repeated outbreaks in our part of the world, compromising health and longevity of the sufferers. Moreover, repeated illnesses add on the financial burden to the family. In our study majority of the respondents had a fair idea about harm and devastating health hazards of typhoid infection and half of them knew its complications (90% and 50% respectively). This was a unique observation seen in our research study.

Social media and public awareness campaign regarding typhoid illness and its prevention has also increased parental knowledge. Because of community and school awareness campaign 37% of our respondents had knowledge about antibiotic resistant typhoid fever, that self-medication and over the counter drugs play a role in developing resistance; while 75% had heard about immunization with the new conjugate typhoid vaccine²⁰.

In our study, ninety percent of participants had positive perception about vaccination that it is safe for their kids and it will prevent further infection and decrease complication and mortality. Moreover, around 3/4th of them had agreed to continue with future vaccination and boosters also while a small percentage had fear of its side effects²¹.

Regarding parental misconception relating to typhoid conjugate vaccine in our study, we observed variable statements/concerns from a small percentage of parents like presence of family planning components or an international conspiracy against our country. This finding was quite contradictory to the findings observed in previous studies^{22,23}.

The rewarding factor of our study was that majority of the parents accepted to vaccinate their child with the new conjugate typhoid vaccine when their concerns were addressed, misconception cleared and myths and beliefs resolved by effective counselling. The doctor is the most important and reliable source of information about vaccines and vaccinations; therefore, maintaining good communication with relevant parents to provide them with the required information is important²⁵. Some people may trust in other individuals or systems more than they trust the health nursing staff²⁶.

The results of this study should be explained given some restrictions. Survey results may not be representative of all Pakistani parents. This was a cross-sectional study with a sample of the study population from the OPD clinic. So the study population composed of caregivers least able to go a hospital. The study is not designed to evaluate reasons for partial immunity or measures taken may be used to solve the problems found in it. It also did not assess the existence of any potential illnesses in the parents, characteristics of siblings or attitudes of parents that may affect vaccine utiliza-

tion. The age range of the parents is also very wide. This can lead to inconsistencies in recall experience related to vaccines, especially among the parents of older children. We suggest similar studies in other tertiary care public and private hospitals and medical institutes so that a large-scale outcome can be inferred.

Conclusion

In conclusion, this study may represent useful information concerning Pakistani parental beliefs, knowledge, attitudes and behaviours toward new conjugate typhoid vaccine. Our study showed positive opinion of a majority of parents regarding their children vaccination. They had a clear knowledge of typhoid illness, were aware of common clinical presentation and knew key preventive measures like hand washing, hygiene and vaccination. They commendably accepted the new conjugate typhoid vaccine as a useful mean to prevent future typhoid illnesses, minimize its complications, decrease financial burden and improve quality of life. A small proportion of parents had certain concerns and myths relating to new conjugate typhoid vaccine which can be resolved effectively by educational interventions.

Conflict of Interests

Authors have no conflict of interests and received no grant/funding from any organization.

References

- 1- Bhandari J, Thada PK, DeVos E. Typhoid Fever. . StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020.
- 2- Robert MK, Joseph WGI, Nathan JB. Nelson Textbook of Pediatrics. 19th ed. Philadelphia: Elsevier; 2020. p. 1502-1507
- 3- Date KA, Bentsi-Enchill A, Marks F, Fox K. Typhoid fever vaccination strategies. *Vaccines* 2015;33:C55-C61. [doi: 10.1016/j.vaccine.2015.04.028.]
- 4- Anwar E, Goldberg E, Fraser A, Acosta CJ, Paul M, Leibovici L. Vaccines for preventing typhoid fever. *Cochrane Database Sys Rev* 2014;1:CD001261. [doi: 10.1002/14651858.CD001261.pub3.]
- 5- Jackson BR, Iqbal S, Mahon B. Updated Recommendations for the Use of Typhoid Vaccine - Advisory Committee on Immunization Practices, United States, 2015. *MMWR Morb Mortal Wkly Rep* 2015;64:305-8.

- 6- Guzman CA, Borsutzky S, Griot-Wenk M, Metcalfe IC, Pearman J, Collioud A, et al. Vaccines against typhoid fever. *Vaccine* 2006;24:3804-11. [doi: 10.1016/j.vaccine.2005.07.111]
- 7- An SJ, Scaria PV, Chen B, Barnafo E, Muratova O, Anderson C, et al. Development of a bivalent conjugate vaccine candidate against malaria transmission and typhoid fever. *Vaccine* 2018;36:2978-2984. [doi: 10.1016/j.vaccine.2018.04.035]
- 8- Klemm EJ, Shakoore S, Page AJ, Qamar FN, Judge K, Saeed DK, et al. Emergence of an Extensively Drug-Resistant Salmonella enterica Serovar Typhi Clone Harboring a Promiscuous Plasmid Encoding Resistance to Fluoroquinolones and Third-Generation Cephalosporins. *mBio* 2018;9:e00105-18. [doi: 10.1128/mBio.00105-18]
- 9- Watson CH, Edmunds WJ. A review of typhoid fever transmission dynamic models and economic evaluations of vaccination. *Vaccine* 2015;33Suppl 3:C42-54. [doi: 10.1016/j.vaccine.2015.04.013]
- 10- Meiring JE, Gibani M, TyVAC Consortium Meeting Group. The Typhoid Vaccine Acceleration Consortium (TyVAC): Vaccine effectiveness study designs: Accelerating the introduction of typhoid conjugate vaccines and reducing the global burden of enteric fever. Report from a meeting held on 26-27 October 2016, Oxford, UK. *Vaccine* 2017;35:5081-5088. [doi: 10.1016/j.vaccine.2017.08.001]
- 11- Basnyat B, Karkey A. Tackling typhoid fever in South Asia: lessons from Vietnam. *The Lancet* 2019;7:E1317-E1318. [doi:10.1016/S2214-109X(19)30320-1]
- 12- Cherian T, Okwo-Bele JM. The decade of vaccines global vaccine action plan: shaping immunization programmes in the current decade. *Expert Rev Vaccines* 2014;13:573-575. [doi: 10.1586/14760584.2014.897618]
- 13- Fadda M, Depping MK, Schulz PJ. Addressing issues of vaccination literacy and psychological empowerment in the measles-mumps-rubella (MMR) vaccination decision-making: a qualitative study. *BMC Public Health* 2015;15:836. [doi: 10.1186/s12889-015-2200-9]
- 14- Sántha, Á., Nagy, M., Erdei, R.J. The Health Literacy of Ethnic Hungarian Mothers in Eastern Europe [Online]. *Italian Journal of Sociology of Education*. 2020;12:91-111. Available from: <http://ijse.padovauniversitypress.it/2020/3/5>. Accessed on: 4th November 2020. [doi: 10.14658/pupj-ijse-2020-3-5]
- 15- Johri M, Subramanian SV, Sylvestre MP, Dudeja S, Chandra D, Koné GK, et al. Association between maternal health literacy and child vaccination in India: a cross-sectional study. *J Epidemiol Community Health* 2015;69:849-57. [doi: 10.1136/jech-2014-205436]
- 16- Kara SS, Polat M, Yayla BC, Demirdag TB, Tapisiz A, Tezer H, et al. Parental vaccine knowledge and behaviours: a survey of Turkish families. *East Mediterr Health J* 2018;24:451-458. [doi: 10.26719/2018.24.5.451]
- 17- AbebeAM, WuduKassaw M, Zemariam AB, EstifanosShewangashaw N. Coverage, Opportunity, and Challenges of Expanded Program on Immunization among 12-23-Month-Old Children in Woldia Town, Northeast Ethiopia, 2018. *Biomed Res Int* 2019;2019:5302307. [doi: 10.1155/2019/5302307]
- 18- Girmay A, Dadi AF. Full Immunization Coverage and Associated Factors among Children Aged 12-23 Months in a Hard-to-Reach Areas of Ethiopia. *Int J Pediatr* 2019;2019:1924941. [doi:10.1155/2019/1924941]
- 19- Qadir MI, Ilyas M. Awareness about typhoid disease among people [Online]. *IJMS Sciences* 2019;3:4-5. Available from: https://www.researchgate.net/publication/333208060_Awareness_about_typhoid_disease_among_people. Accessed on: 4th November 2020.
- 20- Rasheed MK, Hasan SS, Babar ZD, Ahmed SI. Extensively drug-resistant typhoid fever in Pakistan. *Lancet infect dis* 2019;19:P242-243. [doi: 10.1016/S1473-3099(19)30051-9]
- 21- Gust D, Brown C, Sheedy K, Hibbs B, Weaver D, Nowak G. Immunization attitudes and beliefs among parents: beyond a dichotomous perspective. *Am J Health Behav* 2005 ;29:81-92. [doi:10.5993/ajhb.29.1.7]
- 22- Naleway AL, Mittendorf KF, Irving SA, Henninger ML, Crane B, Smith N, et al. Primary Ovarian Insufficiency and Adolescent Vaccination. *Pediatrics* 2018;142:e20180943. [doi: 10.1542/peds.2018-0943]
- 23- King C, Leask J. The impact of a vaccine scare on parental views, trust and information needs: a qualitative study in Sydney, Australia. *BMC Public Health* 2017;17: 106. [doi: 10.1186/s12889-017-4032-2]
- 24- Lahariya C, Khandekar J, Vachher AS, Pradhan SK, UG Students Research Group. Physicians and communities knowledge and awareness about new vaccines in immunization program: A study to derive lesson for increasing uptake. *Kathmandu Univ Med J* 2010;8:51-56. [doi: 10.3126/kumj.v8i1.3222]
- 25- Taylor JA, Darden PM, Slora E, Hasemeier CM, Asmussen L, Wasserman R. The influence of provider behavior, parental characteristics, and a public policy initiative on the immunization status of children followed by private pediatricians: a study from Pediatric Research in Office Settings. *Pediatrics* 1997;99:209-15.
- 26- Paulussen TG, Hoekstra F, Lanting CI, Buijs GB, Hirasig RA. Determinants of Dutch parents' decisions to vaccinate their child. *Vaccine* 2006;24:644-51. [doi: 10.1016/j.vaccine.2005.08.053]