

Prevalence and Determinants of Delayed Vaccination among Children Aged 0-24 Months in Al-Madinah, KSA

Khulood Marzooq Al-Oufi^{1*}, Hanan Mosleh^{2,3}

^{1*}Medical Intern, College of Medicine, Taibah University, Al-Madinah, KSA.

²Associate Professor of Community Medicine, Department of Family and Community Medicine, Faculty of Medicine, Taibah University, KSA.

³Assistant Professor of Community Medicine, Department of Public Health and Community Medicine, Faculty of Medicine, Cairo University, Egypt.

ABSTRACT

Background: The suboptimal compliance to vaccinations continues to be a major public health problem worldwide.

Objectives: To estimate the proportion of children who have delayed vaccinations and to investigate the factors associated with such delays.

Methods: This cross-sectional study was conducted at the Maternity and Children Hospital in Al-Madinah Al-Munawarah, Kingdom of Saudi Arabia, from January to March 2018. The participants, including 149 mothers with children younger than 24 months, were recruited from this hospital. Face-to-face interviews were conducted using a 15-item questionnaire that asked about socio-demographic characteristics, the vaccination statuses of their children, and the causes of delayed vaccinations if available.

Results: Only 40.9% of the children had received vaccinations either on time or with delays of a few days, while vaccinations for 59.1% of the children had been delayed for longer periods of four weeks or more. The most common risk factors for delayed vaccinations were illness of the child at the vaccination time (42.2%), unavailability of the vaccine (22.9%), negligence (17.4%), and other delays based on a physician's advice (16.4%).

Conclusions: A large proportion of children have poor compliance to vaccination appointments, and vaccination providers should be alert to all opportunities to improve the immunization coverage and the need to provide accurate knowledge about the real contraindications to vaccination.

Keywords: Child Vaccination, Delayed Vaccination, Delayed Immunization.


*Correspondence to:

Khulood Marzooq Al-Oufi,
Medical Intern,
College of Medicine,
Taibah University, Al-Madinah, KSA.

Article History:

Received: 12-06-2018, Revised: 08-07-2018, Accepted: 19-08-2018

Access this article online

Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.5.030	

INTRODUCTION

The Expanded Program on Immunization (EPI) aims to achieve and maintain at least 90% vaccination coverage in every country worldwide, and this is one of the most cost-effective means of preventing serious infectious diseases. It is estimated that over 2.5 million deaths are avoided through vaccination every year. In spite of the increases in routine vaccination coverage in the past three decades, the World Health Organization reported in 2016 that around 19.5 million infants worldwide are still missing out on basic vaccines.^{1,2}

It has been documented that a substantial proportion of children from developing and developed countries are currently not being vaccinated on schedule. They not only fail to receive protection from preventable diseases at times when they are most vulnerable but are also at increased risk of never fully completing the vaccination course. Both outcomes compromise successful

childhood immunization programs and put children at risk for serious illness.³

The most common factors for such delays are difficulties with the appointments, upper respiratory tract illnesses, late birth orders, delays based on the advice given by physicians, transport problems, negligence, and not remembering the vaccination schedules. Furthermore, most of the parents of these children are not concerned about the vaccination delays.^{4,5}

It is essential to realize that low overall rates of the targeted diseases mask the persistent threats they pose if compliance to vaccination schedules declines.³ Thus, determining and understanding the factors associated with delayed vaccinations allows us to take a better approach to the at-risk populations for such delays and target our efforts at reinforcing the importance of immunizations.

OBJECTIVES

To estimate the proportion of children less than two years of age who have delayed vaccinations and to investigate the determinants of such delays, to provide policy makers with insights into this situation so they can design and implement appropriate interventions.

METHODOLOGY

Study Setting

Inpatient wards, the emergency department, and outpatient clinics at the Maternity and Children Hospital in Al-Madinah Al-Munawarah.

Study Period

The study was conducted over a period of three months from January 2018 until the end of March 2018.

Study Design

This was a cross-sectional analytic study.

Sampling Design and Sample Size

Participants were recruited from the inpatient wards, emergency room, and outpatient clinics at the Maternity and Children Hospital in Al-Madinah Al-Munawarah. Only mothers with children aged 24 months or less (as per the reported dates of birth) and who live in Madinah were included in the study. The study excluded non-Arabic speakers and children who were more than two years of age. Vaccinations were considered as delayed if they took place four or more weeks after the designated time.^{6,7} The data were collected using a pre-tested 15-item questionnaire in Arabic that was filled in by the interviewer. The questionnaire includes the socio-demographic data and vaccination statuses of the children as well as the causes of delayed vaccinations if available.

The sample size was calculated using OpenEpi (open source statistics for public health) online.⁸ Inputs that were entered for sample size calculation for infinite populations hypothesizing a frequency of delayed vaccination at 9%, an absolute precision of 5%, and a confidence level of 95% yielded a sample size of at least 126 participants.

Data Collection

The data were collected using an interview questionnaire in Arabic. The questionnaire included two parts. The first involved socio-demographic data including age, gender, nationality, the mother's and father's ages, the mother's educational level, residence, and child order. The second part included the immunization status of the child, the vaccinations that had been received, the latest received vaccine, whether the child had had all immunizations at the appropriate time and, if not, the duration of the delay, and finally the reasons for the delay if available.

The questionnaire was prepared by the authors, reviewed for validity by two consultants in family and community medicine, and then pre-tested for comprehension on 20 subjects who were not included in the study.

Statistical Analysis

The data were entered and analyzed using SPSS version 21.⁹ Descriptive statistics were performed using frequencies and percentages for categorical variables. Multivariate analysis was performed using binary logistic regression to investigate factors such as the ages of the children, the sexes of the children, their residences, the educational levels of the mothers, and the child order, which are independently associated with delayed vaccination. Statistical significance was set at a P value <0.05

Table 1: Socio-demographic characteristics of the studied group (n=149)

Socio-demographic Variables		Frequency	%
Sex	Male	83	55.7%
	Female	66	44.3%
Nationality	Saudi	144	96.6%
	Non Saudi	5	03.4%
Mother education:	Illiterate	17	11.4%
	Less Than Secondary	23	15.4%
	Completed Secondary	43	28.9%
	University	65	43.6%
Residence:	Higher Than University	1	00.7%
	Urban Medina	132	88.6%
	Rural Medina	16	10.7%
Child age:	Birth To 2 Months	4	02.7%
	2 To 4 Month	23	15.4%
	4 To 6 Months	23	15.4%
	6 To 9 Months	21	14.1%
	9 To 12 Months	19	12.8%
	12 To 18 Months	28	18.8%
Child Order	18 To 24 Months	31	20.8%
	1 st	31	20.8%
	2 nd	20	13.4%
	3 rd	26	17.4%
Immunization Status	More	72	48.4%
	Vaccinated on Time	40	26.8%
	Delayed Less Than 4 Weeks	21	19.3%
	Delayed 4 Weeks And More	88	80.7%

Table 2: Immunization status of 149 children in different age groups

Age groups	Percent of completed vaccination							
	At birth	2 months	4 months	6 months	9 months	12 months	18 months	24 months
Birth to 2 months	100%							
2 to 4 month	100%	26.1%						
4 to 6 months	100%	73.9%	13%					
6 to 9 months	100%	100%	85.7%	47.6%				
9 to 12 months	100%	100%	100%	73.7%	36.8%			
12 to 18 months	100%	100%	92.4%	92.9%	85.7%	60.7%		
18 to 24 months	100%	95.2%	95.2%	85.7%	71.4%	66.7%	14.3%	
24 months	100%	90%	100%	100%	90%	90%	70%	0%

Table 3: Reasons for no/delayed vaccination among the studied group

Causes of no/delayed vaccination	Frequency (n=116)	%
Illness Of The Child At Vaccination Time	46	%42.2
Unavailability Of The Vaccine	25	%22.9
Negligence	19	%17.4
Physician Advice	18	%16.5
Lack Of Transport	7	6.4%
Others	9	8.3%

Table 4: Determinants of delayed vaccination among the participants

Predictors	P	Exp (B)	CI (95 %)
Age group of the child	0.012	0.772	0.945 – 0.630
Sex of the Child	0.094	1.975	4.377 – 0.891
Mother's Education	0.757	1.067	1.608 – 0.708
Mother's Age	0.840	1.012	1.132 – 0.904
Father's Age	0.257	1.048	1.136 – 0.967
Residence	0.808	0.952	1.415 – 0.641
Child Order	0.264	0.861	1.120 – 0.662

RESULTS

Table 1 shows that 149 mothers with children younger than two years of age were interviewed during the three-month period from January 1, 2018, until the end of March 2018. The ages of the children ranged between one and 24 months, the median age was nine, 55.7% were males, and 96.6% were Saudi.

Only 40.9% of children received vaccination on time, whereas 59.1% were delayed for a period ≥ 4 weeks. In all children, at-birth vaccinations were given on time; the delay appears later, as shown in Table 2. The most common reasons for vaccination delays were illness of the child at vaccination time (42.2%) and unavailability of the vaccine (22.9%); in 16.4% of cases, the delay was based on a physician's advice, while only 6.4% of study participants identified lack of transport as a risk factor (see Table 3). Table 4 shows the determinants independently associated with delayed vaccination in the studied group; the age of the child was found to be the only statistically significant determinant of complete vaccination (p = 0.012). Only those aged 0 to less than 2 months are 100% vaccinated, which is significantly different from all other age groups.

DISCUSSION

Timely immunization is necessary for the prevention of disease. The targeted population of this study was children younger than 24 months. Our findings show that at birth, 100% of children received vaccinations on time, which may be attributable to

mandatory vaccination of newborns before discharge from hospitals. However, nearly 59% of children in the current study did not receive vaccinations on time. This proportion is higher than the results of previous studies in KSA. A study at King Abdulaziz University Hospital in Jeddah, KSA, which investigated delayed primary vaccination among 227 infants, reported that only 9% were not given primary vaccinations on time.⁶ Another study assessing the immunization status of 351 children at five primary health care centers and two tertiary governmental hospitals in Jeddah, KSA, reported that only 24.2% had delayed vaccination.⁷ A similar study conducted in Sao Paulo, Brazil, to assess risk factors for incomplete vaccination among 258 children less than 18 months of age showed that 10.9% of children had incomplete vaccination.¹¹ However, higher frequencies of delayed vaccination were reported by the 2009 National Immunization Survey to assess Parental Delay or Refusal of Vaccine Doses,^{12,13} in which the data of 11,206 children aged 24–35 months were analyzed. Results showed that a total of 39.8% had delayed and/or refused vaccination, specifically: 25.8% had only delayed vaccination, 8.2% had only refused, and 5.8% had both delayed and refused vaccines. Another study conducted in 2001 to assess risk factors for incomplete vaccination and missed opportunity for immunization in rural Mozambique documented that 28.2% of children (n = 668) had not completed the vaccination schedule by two years of age.¹⁴ In a 2008 study at five hospitals in different departments of Argentina, 39.7% of children ≤24 months old were

on a delayed vaccine schedule.¹⁵ Moreover, a 2015 study to evaluate the incidence of delayed vaccination among children under 4 (n = 3,610) in the Expanded Program of Immunization (EPI) covering the outskirts of Iranian cities, concluded that 56.6% of vaccines were administered outside of recommended timeframes.¹⁶ Minor illness represented the most common reason for delayed vaccination, identified by 42.2% of participants. Similarly, 59.3% of parents interviewed in the 2009 National Immunization Survey were more likely to say that they did so because their child was ill.^{12,13}

In contrast, the 2018 study in different locations of Jeddah, KSA, showed that traveling at the recommended time of vaccination was identified by 21.3% of participants as the cause of delayed vaccination.⁷ The 2017 study at King Abdulaziz University Hospital in Jeddah revealed that the most common identified reason for vaccine delay was difficulties with the appointment (30%).⁶

In the present study, 22.9% of mothers reported that unavailability of the vaccine was the reason for delay. This agrees with the results of two studies done in rural Mozambique¹⁴ and The Gambia,¹⁷ which showed that 54.1% and 22.5% of children, respectively, did not have required vaccinations on time; the mothers in those studies referred to vaccine unavailability in the health facility as an important cause.

The least identified reason for delayed vaccination was lack of transportation (6.4%). This contrasts with a 2004 study conducted in four diverse, medically underserved areas of the United States to measure immunization coverage among preschool children, which concluded that the main reason for delaying vaccinations was lack of transportation (46%).¹⁹

In the present study, only the age of the child was found to be a statistically significant determinant of complete vaccination (p = 0.012). This is similar to a 2013 study conducted in Athens, Greece, where the child's age was strongly associated with incomplete vaccination for all vaccines (p < 0.001),¹⁸ and contradicts a 2015 study in Iran, where birth order and the mother's educational level were the most important predictors of delayed vaccination.¹⁴

CONCLUSION

A substantial proportion of children aged ≤ 24 months have delayed vaccination, particularly considering that all children are completely vaccinated at birth. Parents demonstrate poor compliance with vaccination appointments and consider minor illnesses as a reason for non-vaccination. Vaccination providers should take advantage of all opportunities to improve immunization coverage and overcome barriers causing delayed vaccination.

ACKNOWLEDGEMENT

The authors wish to thank Anbar Al-Saadi for her help implementing the survey.

REFERENCES

1. Challenges in global immunization and the Global Immunization Vision and Strategy 2006-2015. *Releve epidemiologique hebdomadaire / Section d'hygiene du Secretariat de la Societe des Nations = Weekly epidemiological record / Health Section of the Secretariat of the League of Nations*. 2006, 81 (19): 190-195.

2. Immunization. World Health Organization. Accessed September 25, 2017. <http://www.who.int/gho/immunization/en/>.

3. Guerra FA. Delays in immunization have potentially serious health consequences. *Paediatr Drugs*. 2007;9(3):143-8. PubMed. <https://www.ncbi.nlm.nih.gov/pubmed/17523694/?i=3&from=%252F18474148%252Frelated>. Published 2018. Accessed September 25, 2017.

4. Rainey JJ, Watkins M, Ryman TK, Sandhu P, Bo A, Banerjee K. Reasons related to non-vaccination and under-vaccination of children in low and middle income countries: findings from a systematic review of the published literature, 1999-2009. *Vaccine*. 2011 Oct 26;29(46):8215-21. doi: 10.1016/j.vaccine.2011.08.096. Epub 2011 Sep 3. WebMD. Accessed September 25, 2017. <https://www.ncbi.nlm.nih.gov/pubmed/21893149/?i=167&from=%252F17523694%252Frelated>.

5. Falagas ME, Zarkadoulia E.. Factors associated with suboptimal compliance to vaccinations in children in developed countries: a systematic review. *Curr Med Res Opin*. 2008 Jun;24(6):1719-41. doi: 10.1185/03007990802085692. Epub 2008 May 9. PubMed. Published 2008. Accessed September 25, 2017. <https://www.ncbi.nlm.nih.gov/pubmed/18474148/?i=5&from=%252F18485194%252Frelated>.

6. Hasanain FH, Jan MM. Delays in primary vaccination of infants living in Western Saudi Arabia. *Saudi Med J*. 2002 Sep;23(9):1087-9. PubMed. Published 2002. Accessed September 25, 2017. <https://www.ncbi.nlm.nih.gov/pubmed/12370718/?i=91&from=%252F17523694%252Frelated>.

7. Banjari M, Alamri A, Algarni A, Abualjadayel M, Alshardi Y, Alahmadi T. How often do children receive their vaccinations late, and why?. *Saudi Med J*. 2018 Apr; 39(4): 347-353. doi: 10.15537/smj.2018.4.21473. PMC. Published 2018. Accessed April 13, 2018. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5938647/>.

8. Sample size for percent frequency in a population. Open Source for public health Open Epi. Accessed Sept. 25, 2017. <http://www.openepi.com/SampleSize/SSPropor.htm>.

9. SPSS Statistics 21.0 Download. IBM Support. <https://www-01.ibm.com/support/docview.wss?uid=swg21608060>. Published 2016. Accessed September 25, 2017.

10. World Medical Association Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects. *Wma.net*. <https://www.wma.net/wp-content/uploads/2016/11/DoH-Oct2013-JAMA.pdf>. Accessed September 28, 2017.

11. Konstantyner T, Aguiar Carrazedo Taddei J, Rodrigues L. Risk factors for incomplete vaccination in children less than 18 months of age attending the nurseries of day-care centres in Sao Paulo, Brazil. *Vaccine*; 29(50), 21 November 2011, 9298-9302. Science Direct. Published 2011. Accessed September 25, 2017. <https://www.sciencedirect.com/science/article/pii/S0264410X11016264#>.

12. DeNoon D. More Parents Refuse, Delay Child's Vaccinations. WebMD. Published 2010. Accessed April 13, 2018. <https://www.webmd.com/children/vaccines/news/20100505/more-parents-refuse-delay-childs-vaccination#1>.

13. Smith P, Humiston S, Marcuse E et al. Parental Delay or Refusal of Vaccine Doses, Childhood Vaccination Coverage at 24 Months of Age, and the Health Belief Model. *Public Health Rep*. 2011; 126(Suppl 2): 135-146.

doi: 10.1177/00333549111260S215. PMC. Published 2011. Accessed April 13, 2018.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3113438/>.

14. Jani J, Schacht C, Jani I, Bjune G. Risk factors for incomplete vaccination and missed opportunity for immunization in rural Mozambique. *BMC Public Health*; 2008;161. <https://bmcpubhealth.biomedcentral.com/articles/10.1186/1471-2458-8-161> . Published 2008. Accessed September 25, 2017.

15. Gentile Á, Bakir J, Firpo V, Caruso M, Lución MF, Abate HJ, Chiossone A, Debbag R. Delayed vaccine schedule and missed opportunities for vaccination in children up to 24 months. A multicenter study. *Arch Argent Pediatr*. 2011 Jun;109(3):219-25. doi: 10.1590/S0325-00752011000300006. PubMed. Published 2011. Accessed April 13, 2018.

<https://www.ncbi.nlm.nih.gov/pubmed/21660387>.

16. Rejali M, Mohammadbeigi A, Mokhtari M, Zahraei SM, Eshrati B. Timing and delay in children vaccination; evaluation of expanded program of immunization in outskirts of Iranian cities. *J Res Health Sci*. 2015 Winter; 15(1): 54-8. Published 2015. Accessed April 13, 2018.

<https://www.ncbi.nlm.nih.gov/pubmed/25821027>.

17. Odutola A, Afolabi MO, Ogundare EO, Lowe-Jallow YN, Worwui A, Okebe J, Ota MO. Risk factors for delay in age-appropriate vaccinations among Gambian children. *BMC Health Serv Res*. 2015 Aug 28;15:346. doi: 10.1186/s12913-015-1015-9. PubMed. Published 2015. Accessed June 13, 2018.

<https://www.ncbi.nlm.nih.gov/pubmed/26315547>.

18. Rosenthal J, Rodewald L, McCauley M, Berman S, Irigoyen M, Sawyer M, Yusuf H, Davis R, Kalton G. Immunization coverage

levels among 19- to 35-month-old children in 4 diverse, medically underserved areas of the United States. *Pediatrics*. 2004 Apr;113(4):e296-302. PubMed. Published 2004. Accessed June 13, 2018.

<https://www.ncbi.nlm.nih.gov/pubmed/15060256>.

19. Pavlopoulou ID, Michail KA, Samoli E, Tsiftis G, Tsooumakas K. immunization coverage and predictive factors for complete and age-appropriate vaccination among preschoolers in Athens, Greece: a cross-sectional study. *BMC Public Health*. 2013 Oct 2;13:908. doi: 10.1186/1471-2458-13-908. PubMed. Published 2013. Accessed June 13, 2018.

<https://www.ncbi.nlm.nih.gov/pubmed/24083352>.

Source of Support: Nil.

Conflict of Interest: None Declared.

Copyright: © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Cite this article as: Khulood Marzooq Al-Oufi, Hanan Mosleh. Prevalence and Determinants of Delayed Vaccination among Children Aged 0-24 Months in Al-Madinah, KSA. *Int J Med Res Prof*. 2018 Sept; 4(5):128-32. DOI:10.21276/ijmrp.2018.4.5.030