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Magnitude of Childhood Vaccine Hesitancy and Associated Individual/Social Group Factors among Parents in Degahbur Town, Somali Region, Ethiopia

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Abstract

Since the introduction of effective and safe vaccines, vaccination has made enormous contributions to public health. Throughout its time, the effectiveness of vaccination programs were governed by multiple factors. Vaccine hesitancy is an emerging public health concern which gained more attention in recent years. Magnitude of vaccine hesitancy is not well known across many parts of the world. The objective of this study was to assess magnitude of childhood vaccine hesitancy and associated individual/social group factors among parents in Degahbur town. Community based cross-sectional study was undertaken in 422 households. Cluster sampling technique was employed to select six study units in Degahbur. Structured questionnaire was used for data collection. EPIDATA 3.02 was used for data entry and SPSS version 20 for data analysis. Bivariate and multivariate analysis was conducted to check the associations between outcome and explanatory variables using binary logistic regression model. Out of the total 422 households selected, 412 (97.6%) have responded to the interviews. From the 412 study participants, 46 (11.2%) were labelled as vaccine hesitant. Perceiving vaccination as not health beneficial (Adjusted Odds Ratio (AOR) = 3.84, 95% CI (1.2, 13.6)), Beliefs in other alternatives (AOR= 4.8, 95% CI (1.5, 15.4)), beliefs that vaccination can't protect children from serious diseases (AOR= 5.82, 95% CI (1.3, 25.6)) and being daily laborer (AOR= 12.9, 95% CI (2.6, 63.5) were predictors of vaccine hesitancy.

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Magnitude of childhood vaccine hesitancy in Degahbur is lower than that reported in other studies. In this study, negative perceptions and beliefs towards vaccines and occupation of parents are associated with vaccine hesitancy. Community based health education programs and vaccination surveillance system should be advocated and developed.

Keywords: Vaccine hesitancy; Childhood; Parents; Care givers; Somali Region; Degahbur.

1. Introduction

In the 19th and the first half of the 20th centuries, childhood deaths from many infectious diseases, including measles, diphtheria and poliomyelitis, were common [1]. Since then, vaccination has made enormous contributions to public health, including the eradication of one dreaded disease, small pox, and elimination of poliomyelitis from all but a handful of countries [2]. Deaths from vaccine-preventable diseases (VPDs) are now very rare in the developed world and their incidence has fallen sharply in many developing countries over the past 10 - 20 years because of successful immunization programs [3]. The Global Immunization Vision and Strategy (GIVS) estimated that between two and three million child deaths are averted annually through vaccination against diphtheria, tetanus, pertussis, tuberculosis, polio and measles [4, 5].

Despite the availability of safe and effective vaccines, there are still large segments of the world population remaining inadequately vaccinated. From the total estimated 5.2 million deaths among under five children worldwide in 2014, 29% was reported to be due to vaccine preventable diseases [1]. Africa has the highest number of under-five mortality rate in the world, with about 40% of the total global under five years children mortality occurring in African countries south of the Sahara desert. Immunization programs face particular challenges and obstacles that are unmatched anywhere else in the world due to Africa's unique regional context - economic, geo-political and ecological [6].

Infant and under five mortality rates in Ethiopia are among the highest in the world. Diarrheal diseases, VPDs and malnutrition are responsible for a majority of childhood deaths in Ethiopia. The Expanded Program on Immunization (EPI) started in Ethiopia in 1980. At this point, the immunization coverage figures varied largely between regions, from more than 80% DPT3 coverage in Tigray to less than 5% in Somali and Afar regions. The current long-term goal of the Ministry of Health by the virtue of Ethiopian National Extended Program on Immunization (ENEPI) Strategy is to achieve 90% DPT3 coverage in all regions. The Federal Ministry of Health (FMoH) intends to develop specific strategies for reaching every corner of the country by implementing new approaches called Reaching Every District (RED) and Sustainable Out-reach Services (SOS) [7]. Children of under-one year of age and women of reproductive age group (15-49 years age) are the targets for the currently available EPI vaccines in Ethiopia (BCG, Measles, DPT-HepB-Hib or penta-valent, Rotavirus, Pneumococcus vaccine (PCV), OPV and TT). Although no booster doses recommended in routine EPI for childhood immunization, there are periodical supplemental doses for measles and polio [7]. With all these efforts, the UNICEF-WHO 2013 report on unvaccinated children in world, estimated that about 0.8 million children in Ethiopia that are still not vaccinated with significant regional variations [8]. Particularly, in pastoralist communities of Somali, Afar and Gambella regions, persistently low EPI coverage (30.7%, 23% and

45.6% respectively) was reported as compared to Addis Ababa Administration and Tigray region (96.4% and 88.3% respectively) [7].

Nowadays public concerns and sense of uncertainty on vaccines become growing threat to vaccination provision triggering people to seek alternative vaccination schedules and decisions to delay or even refuse vaccination [9]. This phenomena has been labelled and investigated as "vaccine hesitancy." WHO-Strategic Advisory Group of Experts on Immunization Working Group (SAGE) describes vaccine hesitancy as a delay in acceptance or refusal of vaccines despite the availability and quality of vaccine service. Vaccine hesitancy occurs on the continuum between high vaccine demand and complete vaccine refusal. Vaccine hesitancy is complex and context specific varying across time, place and vaccines [10]. Although there is limitation of more country specific literatures on the magnitude of vaccine hesitancy, vaccine hesitant individuals are widely regarded to be increasing across countries. In a recent survey conducted in the USA, about 30% of the parents were regarded as vaccine hesitant [11]. Concrete information about the magnitude of childhood vaccine hesitancy and associated factors was not available in Somali Regional State and elsewhere in Ethiopia. Thus, this study was aimed to assess the magnitude of childhood vaccine hesitancy and associated individual/social group factors among parents in Degahbur town, eastern Ethiopia.

2. Methodology

2.1. Study setting

The study was conducted in Degahbur town, Jarar Zone, Somali Regional State of Ethiopia from February to May, 2017. Jarar Administrative Zone is one of the eleven zones in Somali Regional State of Ethiopia. The zone consists of ten districts and one city administration called Degahbur. The estimated total population of the zone as per the last estimation of 2015 is 496,168. Jarar has two main livelihood zones, namely agro pastoral and pastoral. Degahbur town is situated about 160km south east of the regional capital, Jigjiga. The total population of the town is currently estimated to be 47,919. The activities and jurisdiction of Degahbur City Administration is limited to the ten urban Kebeles (smallest administration units) in Degahbur town. The town has one general public hospital, one health center and six health posts that provide services to the public.

2.2. Study design and sample size determination

A community based cross-sectional study was undertaken to assess the magnitude of vaccine hesitancy and identify associated individual/social group factors among parents in the town. All parents/care givers who were rearing children of the age from 0 to 15 years were taken as the study population. Despite the under-five target of EPI vaccines, this age group was chosen because there are periodic supplemental vaccination campaigns against polio (all under 15 years) and measles (all up to 15 years) [7]. From these parents, study subjects were drawn and data was collected from those who tend to be legible. Parents/care givers with mental disabilities and those who were not residing in Degahbur town for at least six consecutive months before the commencement of this survey were excluded from the study. Sample size was calculated using Cochran's single population formula and Epi Info statistical software for double proportion. Since there was no similar study from Ethiopia

or elsewhere with similar settings, population proportion was taken 50% with 5% margin of error and 95% confidence interval. By replacing these values with the formula $n=\frac{Z^2\alpha}{2} \times \frac{p(1-p)}{(D)^2}$ and adding 10% expected non-response rate, gave us a sample size of 422 study participants. For the associated factors, Epi Info 7 was employed and it has executed a final sample size of 389. Therefore, the first was taken as it provided the largest sample size.

2.3. Sampling procedure

Two-stage cluster sampling technique was used. Six kebeles were chosen from the total ten in Degahbur town by lottery method. Approximate geographic center was located for each kebele and one direction was selected from the four possible directions by employing lottery method. 70 households were selected from each study unit and the remaining two households were selected randomly to get the minimum pre-determined sample size. The first study participant was chosen randomly and data collection was proceeded onwards by considering weather households were single – family dwelling or multi – family dwelling.

2.4. Data collection method and quality control

Data was collected using structure questionnaire written in English and translated into Somali language by interviewing parents/care givers. Data collectors/research assistants and field supervisors were trained prior to data collection schedule. They were recruited based on their related profession background. 5% of the study tool was pre-tested on households outside the kebeles selected for the study. Data entry, coding, editing, clearing and double data entering was done using EPIDATA 3.02.

2.5. Data analysis method

Data was analyzed using SPSS Version 20. Univariate analysis was undertaken to describe socio-demographic characteristics section of the data. Then, bivariate analysis and multivariate analysis was conducted to identify the association between outcome variable versus independent variables and finally declare independent predictors variable (s) respectively. In bivariate analysis, crude odds ratio with 95% confidence interval (CI) was calculated for each predictor versus outcome variable using binary logistic regression model. Then, variables with p-value <0.05 or 95% CI with significant associations, were declared to be statistically significant and were proceeded for multivariate analysis for final decision. Using the same model and grouping predictor variables as covariates, multivariate analysis was undertaken by executing adjusted odds ratio with 95% CI. Hosmer and Lemeshow Test was checked for model fitness in multivariate analysis.

2.6. Ethical considerations

Letter of ethical clearance for the study was obtained from the Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University, College of Health and Medical Sciences. Then, it was submitted to the concerned offices in Somali Regional State for notification and further official permissions to commence the study. By explaining the overall objective of the study for the study participants, written and signed

informed consent was secured from each prior to data collection. To maintain confidentiality of information filled in the questionnaires, unique codes were given to each participant and data was secured in a save area.

3. Results

3.1. Socio-demographic characteristics of the study participants

A total of 422 households were selected from six administrative units in Degahbur Town. From the total, 412 have participated in the study giving a response rate of 97.6%. The mean age of the study participants was 33.04 (±10.8 SD). Of the total, 400 (97.10%) were female; 278 (67.50%) of the parents/care givers interviewed had never attended formal education; and 411 (99.80%) were Muslims. Besides, 219 (53.20%) households have 1 to 3 children aged 0 to 15 years; and 360 (87.40%) of the respondents were housewives (Table 1).

3.2. Magnitude of vaccine hesitancy and vaccine awareness among parents/care givers

From the 412 study participants, 46 (11.2%) were found to have been hesitant to all or at least one of the childhood recommended vaccines that are administered routinely and in some cases as a supplementary. Among the 46 vaccine hesitant parents/care givers, 23 (50%) had confirmed that they were hesitant to all recommended vaccines while the rest 23 (50%) mentioned at least one vaccine to which they were hesitant to get for their children. Most important reasons they have raised were; vaccines were not needed, vaccines were not safe, we have bad experience from vaccinators and vaccines, lack of reliable information on vaccines and preference of traditional treatments or prayers. There was no significant difference in the distribution of vaccine hesitant parents in the study units. Regarding awareness/knowledge, (75%) of the respondents received vaccination awareness from health professionals and the rest from different sources or even no source as depicted in the below figure.

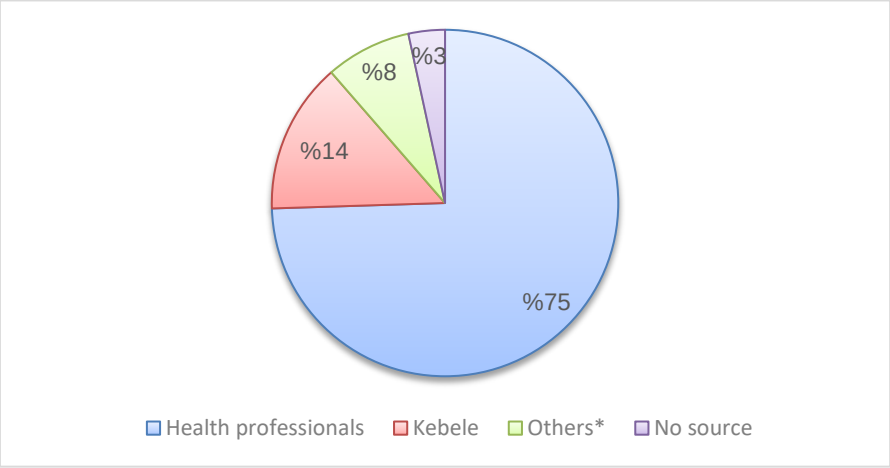

Figure 1: Vaccination awareness/information sources among parents/care givers, Degahbur Town, Somali Regional State, Ethiopia, 2017

**Religious leaders, husbands, teachers and neighbors*

3.3. Factors associated with childhood vaccine hesitancy

Table 1: Socio-demographic factors associated with childhood vaccine hesitancy, Degahbur Town, Somali Regional State, eastern Ethiopia, 2017

	Vaccine hesitant				
Variable	**Yes (%)**	**No (%)**	**COR**	**95% CI**	**P-value**
Age in years					
16-25	9 (8.0)	103 (92.0)	1.00[R]		
26-35	20 (11.4)	155 (88.6)	1.48	(0.65, 3.37)	0.36
36-45	7 (9.0)	71 (91.0)	1.128	(0.4, 3.2)	0.82
≥46	10 (21.3)	37 (78.7)	3.1	(1.2, 8.2)	0.023*
Educational level					
No formal education	28 (10.1)	250 (89.9)	0.37	(0.09, 1.42)	0.22*
Primary school	10 (11.6)	76 (88.4)	0.44	(0.1, 1.87)	0.27
Secondary school	5 (14.3)	30 (85.7)	0.56	(0.11, 2.3)	0.47
College and above	3 (23.1)	10 (76.9)	1.00		
Current marital status					
Married	42 (10.8)	348 (89.2)	1.00		
Single	2 (20.0)	8 (80.0)	2.1	(0.43, 10.1)	0.37
Others**	2 (16.7)	10 (83.3)	1.7	(0.35, 7.8)	0.523
Relationship with the children					
Son/daughter	41 (10.8)	337 (89.2)	1.00		
Grand child	4 (19.0)	17 (81.0)	1.9	(0.6, 6.0)	0.26
Others***	1 (7.7)	12 (92.3)	0.69	(0.087, 5.4)	0.7
Occupation					
Housewife	34 (9.4)	326 (90.6)	1.00		
Merchant	3 (15.8)	16 (84.2)	1.8	(0.49, 6.5)	0.372
Government employee	2 (16.7)	10 (83.3)	1.93	(0.4, 9.2)	0.40
Daily laborer	7 (33.3)	14 (66.7)	4.8	(1.8, 12.7)	0.002*
Number of children from 0-15 years old in a household					
1 to 3	24 (11.0)	195 (89.0)	1.00		
4 to 6	14 (9.0)	141(91.0)	0.81	(0.4, 1.6)	0.54
>=7	8 (21.1)	30 (78.9)	2.2	(0.89, 5.3)	0.088
Monthly income in Ethiopian Birr (ETB)					
<1000	7 (17.5)	33 (82.7)	1.28	(0.5, 3.2)	0.577
1000-3000	14 (7.1)	182 (92.9)	0.47	(0.23, 0.9)	0.029*
≥3000	25 (14.2)	151 (85.8)	1.00		

**Association (p <0.05), **Widowed, divorced, separated, ***Brother/sister, Stepchild, nephew, niece, [R]=Reference factor.*

Independent variables were separately run in binary logistic regression as bivariate variables and the result was summarized as follows (Table 2).

Table 2: Bivariate results of separately regressed explanatory variables on childhood vaccine hesitancy, Degahbur Town, Somali Regional State, eastern Ethiopia, 2017

	Vaccine hesitant				
Variables	**Yes (%)**	**No (%)**	**COR**	**95% CI**	**P-value**
Perception factors on vaccination					
Vaccination as a social norm					
Yes	21 (5.8)	342 (94.2)	1.00		
No	25 (51)	24 (49.0)	16.964	(8.32, 34.59)	0.000*
Vaccination is needed by the public (health beneficial)					
Yes	20 (5.4)	347 (94.6)	1.00		
No	26 (57.8)	19 (42.2)	23.74	(11.29, 49.94)	0.000
Beliefs, attitudes and motivational factors around health					
Belief vaccination can protect children from serious diseases					
Yes	21 (5.8)	343 (94.2)	1.00		
No	25 (52.1)	23 (47.9)	17.75	(8.66, 36.38)	0.000
Belief most parents like you vaccinated their children with the recommended vaccines					
Yes	27 (7.4)	337 (92.6)	1.00		
No	19 (39.6)	29 (60.4)	8.178	(4.066, 16.45)	0.000
Belief modern scientific medicine is effective than traditional one					
Yes	20 (5.7)	333 (94.3)	1.00		
No	26 (44.1)	33 (55.9)	13.12	(6.62, 25.99)	0.000
Sense of self-efficacy and comfort to vaccinate children					
Yes	21 (5.8)	344 (94.2)	1.00		
No	25 (53.2)	22 (46.8)	18.615	(9.036, 38.35)	0.000
Belief in other alternatives instead of vaccinating children***					
Yes	31 (38.3)	50 (61.7)	13.061	(6.585, 25.91)	0.000
No	15 (4.5)	316 (95.5)	1.00		
Knowledge/awareness factors					
Knowledge on vaccination					
Yes	24 (6.5)	345 (93.5)	1.00		
No	22 (51.2)	21 (48.8)	0.66	(0.032, 0.137)	0.000
Knowledge on vaccination schedule					
Yes	20 (6.2)	303 (93.8)	1.00		
No	26 (29.2)	63 (70.8)	6.252	(3.287, 11.89)	0.000
Knowledge on health facility					
Yes	25 (6.9)	336 (93.1)	1.00		
No	21 (41.2)	30 (58.8)	0.106	(0.053, 0.212)	0.000

**Significant association, **Infertility cause, heuristic, harmful, ***Traditional medicines or Religious prayers.*

In the above bivariate analysis of socio-demographic as well as explanatory factors, variables with p – value <0.05, were grouped as covariates and taken for further multivariate analysis. After removing confounding variables that seemed to be associated with the outcome in bivariate analysis, four variables remained to be

independent predictors of vaccine hesitancy in this study area (Table 3).

Table 3: Results from multivariate analysis of variables associated with vaccine hesitancy in bivariate analysis, Degahbur Town, Somali Regional State, eastern Ethiopia, 2017

	Vaccine hesitant			
Covariates	**Yes (%)**	**No (%)**	**COR**	**Adjusted OR with 95% CI**
Occupation of the parents				
Housewife	34 (9.4)	326 (90.6)		1.00
Merchant	3 (15.8)	16 (84.2)	1.8 (0.49, 6.5)	3.35 (0.013, 13.1)
Government employee	2 (16.7)	10 (83.3)	1.93 (0.4, 9.2)	0.192 (0.001, 68.65)
Daily laborer	7 (33.3)	14 (66.7)	4.8 (1.8, 12.7)	**12.9 (2.6, 63.5)***
Perception factors on vaccination				
Vaccination is needed by the public (health beneficial)				
Yes	17 (4.9)	330 (95.1)		1.00
No	29 (44.6)	36 (55.4)	15.64 (7.84, 39.19)	**3.84 (1.2, 13.6)***
Beliefs, attitudes and motivational factors around health				
Belief vaccination can protect children from serious diseases				
Yes	21 (5.8)	343 (94.2)		1.00
No	25 (52.1)	23 (47.9)	17.75 (8.66, 36.38)	**5.82 (1.3, 25.6)***
Belief in other alternatives instead of vaccinating children**				
Yes	31 (38.3)	50 (61.7)	13.06 (6.59, 25.9)	**4.8 (1.5, 15.4)***
No	15 (4.5)	316 (95.5)		1.00

**Significant association (independent predictors), **Traditional medicines or Religious prayers.*

4. Discussion

Based on their decisions to delay/refuse vaccines, eleven percent (11.2%) of the parents/care givers who participated in this study were regarded as vaccine hesitant. This individuals raised at least one reason for their delay of vaccine acceptance or total refusal including concerns about the very need of vaccines, vaccine safety issues, reliability of information about vaccines, fear of the pain of vaccine shots, bad experience on previous vaccinators and or vaccinations and preferences of traditional treatments or religious prayers instead of vaccinating children. This finding was found to be lower than that of recent surveys conducted in the USA separately in three different states of which about 23%, 25% and 30% of the parents/care givers assessed were labelled as vaccine hesitant [11]. For their hesitancy, these parents stressed concerns like the pain vaccines, number of shots given children at once, too many vaccine shots, vaccines causing fever, disabilities attributed to vaccines and vaccines to weaken immune system [11, 12]. In another study from US state of Alaska, the proportion of mothers who indicated that they were vaccine hesitant increased each year from 23.8% in 2009 to 33.2% in 2011 (p-value <0.05) [13]. These variations between the magnitudes and in some of the concerns towards vaccines could be due to differences in study area settings as well as in study designs employed.

From this study, 75% of the parents/care givers described health professionals as their main source for vaccination awareness/information. This is closer to a finding from a nationally representative survey in USA in which 85% of the parents reported health care providers as one of their three most important sources of

information about childhood vaccination [11]. Similar studies from elsewhere in Ethiopia or other countries with similar settings couldn't be found to compare this study's magnitude.

In this study, parents/care givers who have negative perceptions towards childhood vaccination i.e. vaccination to be harmful than beneficial, vaccination as heuristic and concerns about vaccination to cause future infertility of their children were 3.8 times more likely to hesitate vaccination than their similar counter parts who didn't have such perceptions. This finding provides similar evidence with a study from the US state of Alaska which assessed vaccine hesitancy among mothers of three years old children. 29% of those mothers reported that some vaccine shots do more harm than good [13].

Parent's beliefs and availability of other alternatives instead vaccinating children like traditional medicine/treatments and religious prayers were found to be 4.8 times more likely to be vaccine hesitant than those who didn't belief other alternatives. This is supported by a similar findings from a study conducted in the Netherlands in which alternatives medicines acted as a barrier to vaccine acceptability [14]. In another study from Alberta, Canada, three different ethnic backgrounds (Dutch, Hutterite and the alternative practitioner group) were researched for vaccine hesitancy. Among the Dutch, most respondents noted their decision to delay or refuse was based on their religious beliefs and the availability of alternative health practitioners [15].

In a national Immunization survey undertaken by the Center for Disease Control and Prevention, National Center for Immunization and Respiratory Diseases, Atlanta, USA found that parents who delayed and refused vaccines were significantly less likely to belief that vaccines are necessary to protect the health of their children compared with parents who neither delay nor refuse vaccines [16]. Similarly, this study come up with that parents/care givers who didn't belief that vaccines can protect their children from serious vaccine preventable diseases were 5.8 times more likely to be considered as vaccine hesitant than those who belief vaccines can protect such diseases.

Unlike most of the available surveys/researches on vaccine hesitancy, this study included socio-demographic characteristics of the respondents as one of the factors which could be associated to this subject matter. Parents/care givers whose occupations were categorized as daily laborers were 12.9 times more likely to hesitate vaccinating their children with recommended vaccines. This may due to the lower socio-economic status as well as relatively higher illiteracy of this social group in the community. This finding is also supported by a national survey in the USA where parents from the lowest income category including the unemployed individuals reported 50% higher levels of agreement concerns about serious vaccine side effects and lower perceived susceptibilities to VPDs, which could consequently lead childhood vaccine hesitancy [9, 17].

5. Conclusion

Magnitude of childhood vaccine hesitancy in Degahbur town is lower than that reported in other studies. Yet, it seems to be significant with the current study setting. In this study, perceiving vaccination as not health beneficial, beliefs in other alternatives instead of vaccinating children, beliefs that vaccines can't protect children from serious diseases and being daily laborer in occupations are individual/social group factors

associated with vaccine hesitancy.

6. Recommendations

Degahbur City Administration Health Office in collaboration with SRHB, FMoH and other concerned stake holders should advocate community based health education program, engage religious and traditional medicine experts to tailor their expertise in the provision vaccines, and should develop community based vaccination/immunization surveillance system routinely monitored and evaluated by health extension workers. Moreover, we encourage more researches on contextual and vaccine/vaccination related determinants of vaccine hesitancy as this study only focused on individual/social group factors.

7. Acronyms

FMoH: Federal Ministry of Health; SRHB: Somali Regional Health Bureau; UNICEF: United Nations Children's Fund; WHO: World Health Organization; EPI: Extended Program on Immunization; SD: Standard Deviation; VPDs: Vaccine Preventable Diseases; COR: Crude Odds Ratio; OR: Odds Ratio; AOR: Adjusted Odds Ratio.

8. Competing interest

We, the authors declare that we don't have competing interests.

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References

[1] World Health Organization, Ed. (2013). "Vaccine preventable disease surveillance manual."

[2] World Health Organization and United Nations Children's Fund (2005). "Global Immunization Vision and Strategy 2006-2015".

[3] The Royal College of Pathologists of Australia (2012). "Immunization and Vaccine Preventable Diseases. "

[4] Global Immunization Vision and Strategy (2006). "Challenges in global immunization and the Global Immunization Vision and Strategy."

[5] Novelli, V., Khalil, N., Metarwah, B., El-Baba, F., Nahar, R., Abu- Nahya, M. (1991). "Childhood immunization in the state of Qatar: Implications for improving coverage." Annals of Saudi Medicine

11(2): pp. 201-4.

[6] Wiysonge, C., Uthman, O., Ndumbe, P., Hussey, G. (2012) "Individual and Contextual Factors Associated with Low Childhood Immunisation Coverage in Sub-Saharan Africa: A Multilevel Analysis." PLoS ONE 7, e37905 DOI: doi:10.1371/journal.pone.0037905.

[7] Federal Ministry of Health, Ed. (2015). “Ethiopia national expanded programme on immunization.” Comprehensive multi-year plan 2016 – 2020. Addis Ababa.

[8] Lafond, A. and L. Pensieres (2015). "Determinants of Vaccine Uptake in Low Resource Settings."

[9] Dempsey, A., Schaffer, S., Singer, D., Butchart, A., Davis, M., Freed, GL. (2011). "Alternative vaccination schedule preferences among parents of young children." Pediatrics 128(5): 848:856.

[10] Larson, H., Cooper, L., Eskola, J., Katz, S., Ratzan, S. (2011). "Addressing the vaccine confidence gap." 378(9790): 526–35.

[11] Kennedy, A., LaVail, K., Nowak, G., Basket, M., Landry, S. (2011). "Confidence about vaccines in the United States: Understanding parent’s perceptions." Health Aff. 30(6): 1151-9.

[12] Gellin, B., Maibach, E., Marcuse, E. (2000) "Do parents understand immunizations? A national telephone survey." 106, 1097–1102 DOI: http://dx.doi.org/10.1542/peds.106.5.1097.

[13] Margaret, Y., Rebekah, M., Marcy, C. (2013). "Vaccine hesitancy among mothers of 3 years old children."

[14] Larson, H., Jarret, C., Eckersberger, E., Smith, D., Peterson, P. (2012). "Understandingvaccine hesitancy around vaccines and vaccination from a global per-spective: a systematic review of published literature, 2007-2012 " Vaccine 32(19): 2150-9.

[15] Judith, C., Cathy, J., Shirley, A., Cathy, E., Sue, M., Sharon, L. (2002). "Refusals and Delay of Immunization Within Southwest Alberta. Understanding Alternative Beliefs and Religious Perspectives." Canadian Journal of Public Health 109.

[16] Philip, J., Sharon, G., Edgar K., Marcuse., Zhen, Z., Christina, G., Cynthia, H., Beth, H. (2011). "Parental Delay or Refusal of Vaccine Doses, Childhood Vaccination Coverage at 24 Months of Age, and the Health Belief Model." Public Health Reports 126.

[17] Gowda, C. and A. Dempsey (2013). "The rise (and fall?) of parental vaccine hesitancy." Hum Vaccin Immunother 9(8): 1755-62.