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Vaccination status of children aged 1–4 years in Afghanistan and associated factors, 2015

Luke M. Shenton [a,*], Abram L. Wagner [a], Bradley F. Carlson [a], Mohammad Yousuf Mubarak [b], Matthew L. Boulton [a,c]

[a] Department of Epidemiology, School of Public Health, University of Michigan, 1415 Washington Heights, Ann Arbor, MI 48109, USA
[b] Department of Microbiology, Kabul University of Medical Science, Jamal Mina, 3rd District, Next to Ali Abad Teaching Hospital, Kabul, Afghanistan
[c] Department of Internal Medicine, Division of Infectious Diseases, University of Michigan Medical School, 1500 East Medical Center Drive, Ann Arbor, MI 48109, USA

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ABSTRACT

Background: Childhood mortality in Afghanistan fell by half between 1990 and 2015, due in part to the government's commitment to improving pediatric immunization services. Although progress has been made, immunization coverage has nonetheless remained low with only 65% of children receiving the third dose of Diphtheria-Pertussis-Tetanus (DPT3) based on WHO estimates. This study aims to calculate the proportion of Afghan children aged 1–4 years who were fully vaccinated, under-vaccinated, or non-vaccinated with government-recommended Expanded Program on Immunization vaccines and identify predictors related to the family's sociodemographic status and maternal autonomy.

Methods: Data from the 2015 Afghanistan Demographic and Health Survey was used to calculate the proportion of children who were fully vaccinated (i.e. received all recommended vaccines), under-vaccinated (i.e. received some, but not all), and non-vaccinated (i.e. did not receive any vaccines) according to WHO guidelines. A multivariable multinomial logistic regression model generated odds ratios for under-vaccination and non-vaccination versus full vaccination, and examined associations between independent factors and full vaccination status.

Results: We found 40.6% of Afghan children age 1–4 were fully vaccinated, 42.4% under-vaccinated, and 17% non-vaccinated. Large disparities characterized immunization coverage among provinces and between urban and rural regions. Birthing in a government institution (vs. non-institutional setting), a higher number of antenatal care visits, and a visit to a health facility in the past 12 months were all associated with increased odds of full immunization. Factors related to maternal autonomy including maternal decision-making and maternal attitudes towards beating were also significantly associated with vaccination status.

Conclusion: Approximately 60% of children in Afghanistan are under-vaccinated or non-vaccinated, leaving millions of children unnecessarily at risk for vaccine-preventable diseases. Engagement with community and religious leaders to create programs that increase women's autonomy and expand access to institutional delivery could lead to downstream increases in childhood vaccination coverage.

1. Introduction

Childhood immunisations have played a key role in reducing morbidity and mortality from vaccine-preventable diseases. However, large numbers of children globally continue to lack access to inexpensive and readily available vaccines. In 2016, 12.9 million children worldwide had not received any doses of diphtheria-tetanus-pertussis (DTP) [1].

Afghanistan's immunisation program was launched in 1978 by the Ministry of Public Health (MoPH) and has gradually expanded [2]. The current childhood routine immunisation schedule in Afghanistan consists of one dose of Bacillus Calmette-Guérin (BCG) vaccine at birth, five doses of oral polio vaccine (OPV) at birth, 6, 10, 14 weeks and 9 months, three doses of the Pentavalent vaccine (containing DTP, hepatitis B, and *Haemophilus influenzae* type b at 6, 10, and 14 weeks, and one dose of measles containing

* Corresponding author at: Luke 1415 Washington Heights, Ann Arbor, MI 48109, USA.
E-mail addresses: lshenton@umich.edu (L.M. Shenton), awag@umich.edu (A.L. Wagner), bcarlson@umich.edu (B.F. Carlson), mboulton@umich.edu (M.L. Boulton).

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vaccine (MCV) at 9 months of age [3]. In addition, the pneumococcal conjugate vaccine (PCV13) is available for free at health facilities [4].

Although improvements to immunisation services have been realized over the past 25 years, Afghanistan still experiences strong seasonal outbreaks of vaccine-preventable diseases like pneumonia, diarrhea, and measles [5]. Accordingly, child mortality rates are exceedingly high in Afghanistan by world standards [6] with an under-five mortality rate of 91 deaths per 1000 live births in 2015 [7]. Based on the most recent data, the WHO and UNICEF estimate that only 65% of children had received DPT3 placing Afghanistan among the 10 countries globally with the lowest DPT coverage [8,9].

The causes of non- and under-vaccination of children include childhood factors, which encompass gender and location of delivery, household factors, comprising maternal and paternal education, antenatal care, and income, and sociocultural factors, including religion, ethnicity, and language [3,10–12]. Because mothers are typically the ultimate arbiter for their children's medical decisions, female autonomy and empowerment could also theoretically influence vaccination uptake, as well. In 2015, Afghanistan ranked 154 out of 159 countries with regard to the gender inequality index. This metric measures gender-based inequalities in reproductive health, empowerment, and economic activity [13] and Afghanistan's low ranking reflects long-standing struggles with women's rights which were exacerbated by years under conservative Taliban rule [14].

In this study, we used nationally representative data from the 2015 Afghanistan Demographic and Health Survey (DHS) to identify the predictors of under and non-vaccination including factors characterizing sociodemographic status and maternal autonomy. The findings can help inform Afghanistan's efforts to achieve a goal of less than 65 deaths per 1000 live births for children under 5 by 2020 and better control of vaccine preventable diseases including the goal of polio elimination [15,16].

2. Methods

2.1. Study population

The 2015 Afghanistan DHS followed a stratified two-stage sampling design: 260 clusters were selected from urban areas and 690 from rural areas; 101 reserve clusters were later selected to replace clusters deemed inaccessible based on security and safety concerns. Within each cluster, 27 households were chosen through an equal probability systematic selection process, yielding a sample size of 25,650 households. Weights were calculated so that results were representative at the national level.

Information about reproductive health, maternal care, childhood immunisation, and childcare was collected via in-person interviews by trained interviewers with all ever-married women aged 15–49 in each household. The population used for analysis was the three last surviving children from each household who were aged 12–60 months at the time of survey administration [17]. The data used for this study is publicly available from the DHS program website [18].

2.2. Derived variables

Children's vaccination status was assessed through either written record of administration or maternal recall. Children were classified as fully vaccinated, under-vaccinated, or non-vaccinated. Full vaccination was defined as receipt of 1 dose of BCG, 3 doses of OPV, 3 doses of Penta, and 1 dose of MCV [3]. Children who received at least one, but not all, of these doses were considered under-vaccinated and children who had not received any vaccine doses were considered non-vaccinated. We independently examined coverage of PCV13, a more recent vaccine introduction. Vaccination does could include those offered as part of routine services or provided through supplementary immunization activities.

Multiple sociodemographic and healthcare access variables were examined for association with vaccination status based on those found to be significant in previous studies [3,10,11,19,20]. Childhood characteristics included sex, location of delivery, and possession of a vaccination card. A four-way classification was used for location of delivery; children born in an institution were categorized into public vs private institutions, whereas children born in a non-institutional setting were divided into births with a skilled attendant present and those without.

Household characteristics comprised the majority of variables examined including urbanicity, antenatal care, postnatal care, facility visit, maternal education, paternal education, paternal occupation, maternal age at interview, maternal age at first cohabitation, age difference between mother and father, and receipt of maternal tetanus toxoid. Three mass media exposure variables; frequency of reading the newspaper, listening to the radio, and watching TV were collapsed into one variable with mothers being placed into 1 of 4 categories; engage in none of these activities weekly, 1 activity, 2 activities, or engage in all weekly.

Assessment of maternal autonomy, included maternal working status, number of other wives, maternal decision-making autonomy, maternal attitudes towards wife beating, and maternal ownership. Each measure of maternal autonomy was designed through consideration of the current literature and the wording of the survey questions administered [21,22]. For decision making autonomy, mothers were classified as having none, some, or full decision-making autonomy based on their answers to questions about who in their household makes decision related to their health-care, large household purchases, and visits to relatives. Maternal attitudes towards wife beating was dichotomized into those responding that beating is justifiable vs those that did not based on whether they thought beating was justified under 5 different scenarios; the wife goes out without telling her husband; the wife neglects the children; the wife argues with her husband; the wife refuses to have sex with her husband; and, if the wife burns the food. Those answering yes to any one of these 5 questions was classified as beating justified. Finally, a variable relating to maternal ownership was created based on whether the mothers owns a home and land, one of them, or neither.

Sociocultural variables included ethnicity and primary language. Ethnicity was collapsed from 9 categories to 7 due to small cell size in bivariate analysis.

2.3. Statistical analysis

Bivariate analysis was performed to assess the unadjusted associations between full vaccination status and all independent explanatory variables using Rao-Scott chi-square tests. A multivariable multinomial logistic regression model was built to determine the associations between independent factors and full vaccination status. The regression model was built through consideration of previous literature. Predictors in the multivariate model include sex of child, locality, ethnicity, health facility visit, delivery location, maternal education, paternal education, maternal age at interview, maternal age at first cohabitation, age difference between mother and father, number of other wives, number of children under 5, mass media exposure, maternal work status, paternal occupation, wealth index, decision making autonomy, beating is justifiable, and maternal ownership. We tested predictor variables for collinearity and did not find a strong correlation between any two variables (results not shown). All descriptive,

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