

Service Utilization Patterns for Childbirth and Neonatal Mortality in the Occupied Palestinian territory during Conflict

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Abstract

Background. The global incidence of man-made crises has increased in the last decade. Evidence on demand-side deviations in service uptake during conflict is needed to better understand the link between conflict and adverse neonatal outcomes. We assessed the association between conflict intensity in the Occupied Palestinian territory (OPT) at time of birth and 1) utilization patterns for childbirth across different providers; and 2) neonatal mortality.

Methods. We combined data on conflict intensity with 4 demographic and health surveys (2004, 2006, 2010 and 2014), that included nationally representative samples of women of childbearing age. Our exposure variable was casualties per 100,000 population in defined sub-regions of the OPT. Our outcome specifications were a binary variable for neonatal deaths and a categorical variable for childbirth location. We used multivariate logistic regressions to assess the associations.

Results. High conflict intensity was associated with fewer childbirths in the private sector [RR= 0.97, p= 0.04], and non-governmental organizations [RR= 0.95, P=0.03] compared to public facilities. Conflict intensity was however not predictive of neonatal mortality beyond 2004.

Conclusions. Policy implications include better preparedness in the public sector for maternal care provision during conflict and exploring reasons for the slow decline in neonatal mortality in the territory beyond conflict at time of birth.

Keywords.

Armed conflict; neonatal mortality; childbirth; healthcare utilization

INTRODUCTION

Since 2011, armed conflict has been on the rise, with one in every four people living in a conflict zone today[1]. Research from several contexts has linked conflict to adverse neonatal outcomes, including low birth weight, congenital complications, and still and premature births[2,3,4,5,6,7].

Several studies point to changes in services provision or uptake as potential drivers of adverse neonatal health outcomes in conflict settings. Evidence from the Syrian refugee context and Croatia found decreased access to antenatal care and skilled childbirths during conflict[8,9]. A recent study found an association between conflict and decreased cesarean section rates in the oPt[10]. Delays in seeking care among pregnant women, and compromised service provision have been identified in other contexts[11,12,13,14,15]. Exploring these relationships is warranted to derive policy measures that could limit the effect of conflict on pregnancy outcomes.

In this study, we assess changes in neonatal mortality rates and women's service utilization patterns for childbirth in the oPt during conflict. We first investigate whether conflict at time of birth predicts neonatal mortality. Heightened conflict during pregnancy was associated with lower birth weight in the territory[16]. Evidence from other contexts shows that prenatal stressors can cause several other birth complications[17,18]. While neonatal mortality from complications is largely preventable with simple measures such as breathing masks, and skin-to-skin contact[19], conflict may induce mortality if providers of maternal care cannot respond to induced complications properly, or if they experience consequences like reduced staff attendance or

supply shortages. Neonatal mortality has also stalled in parts of the oPt since 2006 – the reasons for which warrant exploration[20].

We also analyze service utilization patterns for childbirth at times of political turbulence. Several providers offer delivery and neonatal care including the public sector, the private sector, non-governmental organizations (NGOs), facilities within Israel, and one United Nations Relief and Works Agency (UNRWA) hospital available for refugees[21]. Accessing Israeli facilities however requires getting permits via a lengthy process, and long-travel distances with checkpoints and cross borders. There is no clear referral system from primary to tertiary care, and provider choice largely depends on patients. Further information about the health system and patients' protracted access restrictions have been extensively described in the literature[10,22,23].

While research in low-resource contexts shows that women are willing to bypass closer facilities for better care, heightened conflict may push women to avoid long travels[24,25]. Women may also avoid Israeli facilities in an atmosphere of low trust and/or due to movement restrictions across borders. Due to the economic consequences of conflict, households may also limit themselves to the free care provided by public facilities.

METHODS

Data and Study Sample

We use several datasets from the Palestinian Central Bureau of Statistics: the 2004 Demographic and Health Survey, 2006 Pan Arab Project for Family Health, and 2010 and 2014 Multiple Indicator

Cluster Surveys. These surveys comprise nationally representative samples of women of childbearing age (15-54 years). The surveys include details about women's birth histories in the 5 years preceding the survey, including childbirth location. The duration during which this study takes place, ranging between 2002 and 2014, covers the second Intifada from 2002 to 2006, the 2008 Israel war on Gaza, and other shorter-term conflicts. We also obtain mid-year population projections at the province-level in the territory for the years covered. Finally, we utilize data from B'Tselem, the Israeli Information Center for Human Rights, which tracks the number of conflict-based casualties on a daily basis. Previous research confirmed the reliability of these data[10].

We build pooled cross-sectional data using the household surveys. Our sample consists of all births, alive or dead, that took place in the 24 months preceding each survey (N= 14,153). The 2-year inclusion frame was particularly chosen to maximize sample size and avoid survey overlap with respect to births covered. It was also chosen to minimize recall bias and changing household circumstances between birth time and interview date by excluding births that took place outside the two years preceding the survey. Given that the older surveys (2004 and 2006) did not provide exact interview dates, the middle month of the data collection period was used to estimate the interview time and consequently birth age at time of survey.

Measuring Conflict Intensity

The exposure, conflict intensity, is the number of conflict-induced casualties per 100,000 population during the month of birth in each sub-region (North West Bank, Central West Bank, South West Bank, North and Central Gaza, South Gaza). While measuring conflict intensity at a

smaller geographical scale would have produced a more precise measure, the 2004 survey did not provide information on location beyond sub-region. To quantify the exposure, the number of casualties was divided by the corresponding population size estimate. We assumed a linear increase in population by month. We matched each birth with the corresponding conflict intensity by month, sub-region, and year.

Measuring Neonatal Mortality and Childbirth Location

The first outcome is neonatal mortality, defined as women's reported deaths of their children within 28 days from birth. The second outcome is a categorical variable for reported childbirth location of the births, specified by ownership: governmental, private, NGO, or Israeli facilities, and an 'other' category for reported births outside the health system, those taking place in maternity centers with unspecified affiliation, or in UNRWA centers³.

Statistical Analysis

We applied multivariate logistic regression models to assess the relationship between conflict intensity, neonatal mortality, and service delivery location, respectively. Covariates included single status (singleton versus not), child sex, birth interval (less than 2 years, 2 years or more, or being a first birth), maternal age at time of birth (less than 18 years, 18-25, 25-35, and over 35 years), marital status (married versus not), and educational attainment (primary or less, secondary, high school or higher). Given the absence of a wealth index for the 2004 and 2006 surveys, we created

³ UNRWA wards were closed in 2006, leaving only one hospital for childbirth in Qalqilya.

a variable for household socioeconomic status for all surveys through principal component analysis[26]. We also controlled for locality type (rural, urban, and camp) and sub-region to assess for regional-level variations such as infrastructural development and religious views. To account for different survey designs, we generated a variable for survey-specific strata. We also generated a primary sampling unit variable for the 2004 and 2006 surveys, given the unavailability of the variable, via 'k-means clustering' approach. Standard errors were clustered at the primary sampling unit.

We ran two sensitivity analyses to account for design limitations. First, we included births occurring one month outside the 0-24 months inclusion criteria for surveys 2004 and 2006, to account for the potential exclusion of births given our estimation method for the interview date for those two surveys. We used multiple imputation to missing predict birth location for all births in the 2006 survey that met our inclusion criteria but had no information on childbirth location.

RESULTS

Figure 1 shows the variation conflict intensity during the period of the study over time and sub-region. Central West Bank has, on average, the lowest conflict intensity, while the Gaza Strip sub-regions have the highest conflict intensity after 2004.

Table 1 shows the weighted summary measures for background characteristics for each surveys. Maternal age at birth and maternal education have both increased across survey years. The percentage of women delivering at or less than 18 years of age decreased from 2.4% in the 2004

survey to less than 1% in the 2014 survey. Women with high-school education or more increased from 12.8% to 39.0% over that period.

Table 1 also summarizes the neonatal mortality rate per 1,000 live births for each survey, and it shows that the rate has stalled between 2010 and 2014 at around 11 per 1,000 live births. With regards to the birth location distribution, the percentage of childbirths at governmental facilities has increased – from 518 per 1,000 live births in the 2004 survey to 618 per 1,000 in the 2014 survey but was variable among other providers. Births in Israeli facilities and NGOs were the lowest in all survey years, at 31 and 90 per 1,000 lives births in the 2014 survey, respectively.

Conflict intensity at time of birth had no overall association with neonatal mortality, with an odds ratio of 1.00 (95%CI:0.94,1.07; $p=0.96$). Breaking the relationship further in Table 2, we find that conflict intensity at time of birth was only associated with neonatal mortality for births between 2002 and 2004 but not further (OR=1.18, 95%CI:1.05,1.34; $p=0.01$). Other factors predicting neonatal mortality included being a single female child, for a younger and educated mother, with birth spacing of more than 2 years. We re-ran the analysis including births within one month of the inclusion criteria for the older surveys and found similar results (Supplementary Table A1).

We find a significant association between conflict intensity at time of birth and childbirth location (Table 3). Holding else constant, a one unit increase in casualties per 100,000 population is associated with a 5% decrease in the relative risk of delivering in NGOs compared to the public sector (RR= 0.95, 95%CI:0.91,1.00; $p= 0.03$), and a decline in the relative risk of delivering in private

facilities (RR =0.97; 95%CI:0.94,1.00; p= 0.04) (Table 3). Compared to the risk of delivering in the public sector, the relative risk of delivering in an Israeli facilities decreases by 11% with a one unit increase in conflict intensity but is insignificant at the 5% level (RR:0.89; 95%CI:0.52,1.51; p=0.67). Imputing missing childbirth location does not change the results (Supplementary Table A2).

DISCUSSION

This study investigated utilization patterns for childbirths and neonatal mortality during conflict in the oPt. Our results show that conflict intensity at time of birth is not associated with neonatal mortality beyond the initial years of the second Palestinian *intifada*. One potential explanation is that the second *Intifada* comprised a longer-term conflict that overstretched the health system and potentially impacted health outcomes due to compromised routine care childbirth. Subsequent political turbulences have been shorter in duration. The 2008 Gaza-Israel war, for example, was around one month long. Neonatal mortality increases may thus be a concern at times of long-term conflict.

Another plausible explanation is that maternal care provision has improved over time to limit the impact of conflict on neonatal mortality. Indeed, between 2009 and 2016, the number of neonatal units increased from 181 (15.5 per 10,000 live births) to 219 (16.7 units per 10,000 live births)[27]. A recent neonatal study has also shown that basic equipment and medical staff on duty on weekdays are available in the majority of facilities[28]. Nevertheless, quality protocols, referral systems, and necessary drugs for complications like antibiotics and infusion drugs constitute

shortages[28]. The suboptimal quality of care, particularly for complications, could be a potential explanation for neonatal mortality stalling in recent years.

Our study also shows that conflict at time of birth predicts shifts in service utilization from the private sector and NGOs to governmental facilities. These results suggest that women may be more likely to utilize closer facilities and free services during conflict. As the largest provider in the OPT, public facilities are presumably easier to access, and reaching them may be less restricted.

Our analysis presents a number of strengths. First, it is of direct policy relevance. Results suggest that childbirths concentrate in public facilities at times of conflict, which means that public facilities could focus on better preparedness for conducting a higher number of births during conflict. Our study builds on previous studies that link conflict to low birth weight and another study showing that increased conflict predicts a decline in C-section rates[10]. Second, our study combines information from multiple years, and we account for survey design issues and limitations with robustness checks. Our measure of conflict is an improvement of other specifications previously used in the literature, which used either the absolute number of casualties or the square root of the number of casualties [10,16], and thus allows for more straightforward interpretations. Furthermore, the response rate for the women's questionnaire in all years was very high (2004:97.6%, 2006:98.3, 2010:80%, 2014:95.7%). Finally, factors predicting neonatal survival in our analysis are congruent with previous findings[29,30,31].

Our work comes with several limitations. Our conflict measure does not account for other attributes of conflict such as checkpoints, border closures, curfews, and morbidities. Additionally, the limitation of geographical location of births in 2004 to sub-regions, did not allow measuring conflict intensity at the governorate level. Our study is at the country level, necessitating further assessments at sub-national levels where data would be available. Lastly, conflict intensity is an endogenous variable and thus our analysis precludes causal inference.

Future work could explore the relationship with other child health complications and use governorate-level data for stronger evidence. Assessing the hypothesis suggested for the shifts in utilization through focus groups can also build on the study results.

Author contributions

ZAS and TL developed the research question. ZAS led the study design and statistical analysis and wrote the manuscript. TL contributed to finalizing the manuscript.

Conflict of interest

The authors report no conflict of interest.

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Key points

- This study aimed to assess patterns in neonatal mortality and service utilization for childbirth in the Occupied Palestinian Territory during conflict.
- The analysis, which combined nationally representative surveys from multiple years, shows that conflict at time of birth predicts higher utilization of the public sector for childbirths.
- Results also show that conflict at birth does not predict neonatal mortality beyond 2004.
- Policy implications include greater preparedness for childbirths at the public sector during conflict.

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