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Neonatal Death Audit Analysis Report

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List of abbreviations

BML	Beirut and Mount Lebanon
ISSP	Higher Institute of Public Health
MoPH	Ministry of Public Health
NICU	Neonatal Intensive Care Unit
NNM	Neonatal Mortality
NNMR	Neonatal Mortality Rate
PHC	Primary Health Care
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences
TPA	Third Part Administrator
USJ	University Saint Joseph
UNHCR	United Nations High Commissioner for Refugees

Executive Summary

A total of 98 neonatal deaths audited between January 1st and March 31st 2021, and included in this report. There was an overall reduction of 13% in neonatal mortalities reported in quarter one, compared to quarter four 2020[1], However higher when compared to last year first quarter (68 NNMs in Q.1 2020). Results for this quarter show that although around a third of the audited neonatal mortalities were in the Bekaa region (35%), the neonatal mortality rate for the Bekaa was the lowest among the four regions in the country with rates ranging from 11.15 deaths per 1000 live births in the Bekaa to 13.59 deaths per 1000 live births in the South. These rates and trends differ from those seen during the first quarter of 2020 showing the need for neonatal audits to get a better grasp on the situation, achieve and maintain the recommended SDG target of less than 12 deaths per 1000 live births by 2030.

1 Background

Neonatal mortality which is addressed in the third sustainable development goal (SDG) is a serious public health problem that is often used as an indicator of economic development. One of the tenants of SDG 3 is to eliminate preventable newborn deaths and reduce neonatal mortality to less than 12 per 1,000 live birth by 2030[1]. Therefore, it is important to continuously monitor risk factors of neonatal mortality in order to improve the quality of life of children and reduce child mortality. Such risk factors include biological and socioeconomic determinants, as well as characteristics of healthcare in the prenatal, delivery and postpartum periods[2].

The neonatal period which covers the first 28 days of a child's life is the most vulnerable time for an individual's survival with an average global rate of 17 deaths per 1,000 live births in 2019[3]. This contrasts with the probability of dying between the age of 1 month and 1 year and the probability of dying between the ages of 1 and 5 years which were estimated at 11 deaths per 1,000 and 10 deaths per 1,000 respectively in 2019. In that same year, there were approximately 6,700 neonatal deaths per day globally with a total of 2.4 million neonatal deaths, a third of which died within the first day after birth, and close to three-quarters within the first week of life.

There are huge disparities in neonatal mortality rates across regions and countries with more than half of all neonatal deaths occur in countries where neonatal mortality rates exceed 30 deaths per 1,000 live births[4]. Many of these countries have experienced recent conflicts or humanitarian emergencies and are hosting refugees. Currently, neonatal deaths account for approximately 44% of all deaths of children under the age of five within low-middle income countries.

[1] https://www.un.org/development/desa/disabilities/envision2030-goal3.html
[2] Teixeira, G.A. et al. (2016). Risk factors for neonatal mortality in the life of first week. J. res.: fundam. care. Online 8(1): 4036-4046
[3] https://data.unicef.org/topic/child-survival/neonatal-mortality/
[4] https://www.unhcr.org/54bd0dc49.pdf

Neonatal death audit is the process of systematically capturing information on the number and causes of all neonatal deaths, conducted in a no-blame, interdisciplinary setting, in order to improve the care provided to all mothers and babies[1]. Death reviews provide opportunities to examine the circumstances surrounding, as well as the immediate and contributing causes leading to, a neonatal death. The main objective of such an audit is to identify potential avoidable factors linked to these deaths and ultimately future morbidity and mortality[2]. Neonatal mortality audit is particularly important as care often falls between different providers and even between different departments or units[3,4].

The Syrian refugee population in Lebanon since 2011, remains the largest concentration of refugees per capita and the fourth largest refugee population in the world[5]. It is estimated by the Lebanese government to be around 1.5 million refugees, with 855,172 registered with UNHCR as of end of March 2021. A higher neonatal mortality rate, above the SDG target, is observed among the Syrian refugee population compared to the host community. However, currently there is no established system of data collection related to neonatal mortalities in Lebanon that would allow the possibility to identify and address the causes of elevated mortality rates.

2 Objectives

- Collect data and maintain a database for neonatal deaths, among refugees for 2021, which includes key variables such as age at death, place of death, gestational age, maternal age, birth weight, Apgar score, maternal antenatal history, type of delivery, length of labor, symptoms/signs prior to death, treatment given, etc.

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[1] Kerber K.J. et al. (2015). Counting every stillbirth and neonatal death through mortality audit to improve quality of care for every pregnant woman and her baby. BMC Pregnancy and Childbirth 15(Suppl 2): S9. http://www.biomedcentral.com/1471-2393/15/S2/S9

[2] http://www.who.int/pmnch/knowledge/publications/summaries/ks27/en/

[3] Pattinson R. et al. (2009). Perinatal mortality audit: counting, accountability, and overcoming challenges in scaling up in low- and middle-income countries. Int J Gynaecol Obstet. 107 (Suppl 1): S113-21, S121-2. doi: 10.1016/j.ijgo.2009.07.011

[4] Buchmann E.J. (2014). Towards greater effectiveness of perinatal death audit in low- and middle-income countries. BJOG 121 (Issue Supplement s4): 134–136

[5] https://www.unhcr.org/lb/wp-content/uploads/sites/16/2018/12/VASyR-2018.pdf

- Provide a summary of the findings and offer recommendations for the improvement of neonatal care
- Provide a summary of current and potential contributing factors.

3 Methodology

The neonatal audit process consisted of:

- Conducting interviews with caretakers and hospital personnel
- Compiling information from medical records and death certificate
- Completing the audit form, including details of the events leading up to the death
- Submitting the completed forms to UNHCR within 72 hours of receipt of report of death.

3.1 Population and Sample

This audit included refugee households that have experienced neonatal deaths in a UNHCR hospitals network within a Neonatal Intensive Care Unit (NICU) across all regions of Lebanon. Hospitals are grouped geographically into 4 areas: Beirut Mount Lebanon (BML), Bekaa, South and North Lebanon. There are, in fact, 34 hospitals in the network, with 29 hospitals in the network with potential neonatal deaths. These are distributed as follows:

- Beqaa: 7 hospitals
- North: 7 hospitals
- BML: 5 hospitals in ML and 3 hospitals in Beirut
- South: 7 hospitals

Not all the 34 hospitals on the UNHCR hospital network list have neonatal units and therefore, some might not contribute any eligible cases for this audit.

3.2 Data Collection, Management and Analysis

The data collection process was initiated by a standardized email from the UNHCR focal point to the respective Higher Institute of Public Health (ISSP) – USJ field investigators with the project coordinator in cc. The field investigators confirmed

receipt or were contacted by the ISSP project coordinator to alert them of the email and confirm their receipt.

The ISSP project coordinator followed up with the field to ensure that the process was completed in a timely manner. One field investigator, recruited from the area of interest, was assigned per area. Field investigators conducted the neonatal audit by collecting primary data through phone interviews with the parents or relatives and secondary data through the abstraction of medical records in the hospital where the death occurred. In most cases, they were also able to confirm the information directly from the medical personnel in charge of the case. They used the neonatal mortality event review form provided and agreed upon by UNHCR which was filled out and submitted, within 2-3 days, using the Kobo toolbox, a toolkit for collecting and managing data. The coordinator reviewed and any inconsistencies were reported back to the field for clarification. The forms were then completed and put them on hold pending review and confirmation by the medical consultant. Once the forms were finalized, they were approved by the coordinator on Kobo, downloaded and placed on a shared platform for UNHCR follow-up.

UNHCR facilitated the task by ensuring the cooperation of the Third Part Administrator (TPA) and by informing the hospitals of the process in writing. The field investigators were provided with an USJ ID card and a formal letter issued by UNHCR. The field investigators were individually trained by the project coordinator. A debriefing session is held every quarter to get feedback from the field.

The results were entered and analyzed using SPSS. Descriptive results are presented in tables.

3.3 Ethical Considerations

The information received from the UNHCR focal point on the alerts through the TPA contains the infant's name, a contact number for the parents and the TPA delegate, the hospital where the neonatal death occurred as well as the date of and reason for admission.

Due to ethical considerations, the field investigators started the data collection process by interviewing the parents and requesting their permission to access their medical files. Once the permission was granted, the field investigators contacted the TPA delegate in order to arrange access to the hospital files. In cases, where the hospitals refused to share the patient files data was collected from the TPA files.

4 Results

4.1 Quantitative Findings

4.1.1 Distribution of Neonatal Deaths

A total of 102 alerts, 33 in January, 30 in February, and 39 in March, were received in between January 1, 2021 and March 31, 2021 (Q1) of 2021. Of these three were for December deaths (already included in Q4 of 2020) and five were not done because the parents could not be reached using the phone numbers provided. Moreover, four alerts received in April for deaths in Q1 were added to the remaining 94 cases. Therefore, there were 98 infant deaths among refugees using UNHCR network hospitals in Lebanon that were audited during Q1 of 2021. Thirty-five percent (35%) of the hospital-based neonatal deaths among refugees in Lebanon occurred in the Bekaa and only 12% in BML (table 1).

Table 1: Distribution of neonatal deaths among refugees in UNHCR network hospitals by region, Lebanon first quarter 2021 (n=98)

Region	Number	Percent	Live Births	NNMR[1]	Total Registered Refugees[2]
Bekaa	34	34.7	3050	11.15	334,668
South	28	28.6	2061	13.59	92,493
North	24	24.5	1891	12.69	230,601
BML	12	12.2	1017	11.78	197,410

Only 16 of the 34 network hospitals reported refugee neonatal deaths between January 1, 2021 and March 31, 2021. Most of the cases (89%) in the South and 71% of the cases in the North came from 2 hospitals in each governorate (table 2). It is important to note that some hospitals in UNHCR hospital network are NICU referral hospitals specialized in NICU admissions and receive NICU referrals from other hospitals which in turn increase the number of NNMs in the hospitals in comparison to other hospitals.

As depicted in Table 1, the second highest number of Neonatal mortalities is reported in South Lebanon where the lowest number of refugee population resides. This might be attributed to the fact that the two major hospitals in South Lebanon receive many referrals from BML area which in turn increase the number of NNM in comparison to other areas. Although South constitute 11% of the refugee population, the hospitals in South received 28% of the total referrals in Q1 2021 (mainly from BML) corresponding to the high proportion of mortalities.

[1] Total neonatal deaths/total deliveries*1000

[2] http://data2.unhcr.org/en/situations/syria/location/71

Table 2: Distribution of neonatal deaths among refugees in UNHCR network hospitals by hospital, Lebanon first quarter 2021 (n=98)

Hospital Code	Neonatal death	Percent	Live Births	Neonatal Admission
S01	14	14.3	694	136
Bek03	12	12.2	423	76
S02	11	11.2	713	177
N04	10	10.2	138	38
Bek02	8	8.1	945	86
N01	7	7.1	307	36
Bek01	7	7.1	371	81
N02	6	6.1	442	72
Bek04	5	5.1	412	44
N05	3	3.1	316	43
ML01	3	3.1	313	27
S03	3	3.1	326	58
B01	3	3.1	407	38
ML04	2	2.0	113	12
Bek07	2	2.0	580	37
B02	2	2.0		53

4.1.2 Characteristics of Neonatal Deaths

Table 3 describes the characteristics of 97 Syrian and 1 Iraqi neonatal death audited among refugees in UNHCR network hospitals in Lebanon during the first quarter of 2021. Sixty-four percent (64%) of the infants died within 7 days of birth and 55% were males. Where documented, most of the infants had no umbilical infection (95%), 94% required resuscitation and 81% were given vitamin K at birth. Sixty-nine percent (69%) of the infants had low birth weight with 38% weighing less than 1500g. Of the neonates with low birth weight, 86% were premature and 24% were born to adolescent mothers. The mean Apgar score was 3.5 with a standard deviation of 2.2 at 1 minute and 4.7 with a standard deviation of 2.1 at 5 minutes. Note that Apgar scores at 1 and 5 minutes were not documented in 35% and 41% of the cases respectively.

Most of the infants (95%) were placed on a mechanical ventilator and given parenteral antibiotics (82%) at birth (Table 4). In addition, 79% were provided with IV fluids and 59% were intubated. Sixty-eight percent (68%) of the neonatal deaths were admitted to hospital after birth with around half (54%) being internal referrals to the NICU. Fifteen (15) cases (22% of those admitted) were hospital to hospital transfers at birth.

Table 3: Characteristics of the neonatal deaths among refugees in UNHCR network hospitals, Lebanon first quarter 2021 (n=98).

Characteristic	Number	Percent
Gender		
Male	54	55.1
Female	44	44.9
Age at time of Death		
< 24 hrs.	7	7.1
1-2 days	22	22.4
3-6 days	34	34.7
7-13 days	20	20.5
14-20 days	8	8.2
21-27 days	7	7.1
Low birth weight (≤ 2500)		
Yes	66	67.3
No	30	30.6
Not documented	2	2.1
Birth weight classification		
Extremely low birth weight ≤ 1000 gm	18	18.4
Very low birth weight 1001-1500 gm	18	18.4
Moderate low birth weight 1501 -2500	30	30.6
Normal birth weight > 2500 gm	30	30.6
Not documented	2	2.1
Resuscitation required		
Yes	82	83.7
No	5	5.1
Not documented	11	11.2
Umbilical infection		
Yes	4	4.1
No	78	79.6
Not documented	16	16.3
Prophylaxis (more than 1)		
Vitamin K	69	70.4
Eye ointment	58	59.2
Surfactant	32	32.7
None	8	8.2
Not documented	13	13.3
Characteristics	**Mean ± SD[1]**	**Min-Max**
Apgar Scores		
1 minute (n=64)	3.5 ± 2.2	0-8
5 minutes (n=58)	4.7 ± 2.1	0-9

[1] SD = standard Deviation

Table 4: Interventions provided at admission among refugees in UNHCR network hospitals, Lebanon first quarter 2021 (n=98)

Interventions provided (more than 1 per neonate)	Number	Percent
Medications:		
Parenteral antibiotics	90	91.8
IV fluids	77	78.6
Vaccines	26	26.5
Oxygen	24	24.5
Phototherapy	19	19.4
Fresh frozen plasma	19	19.4
Transfusion	16	16.3
Parenteral anticonvulsants	6	6.1
Dopamine	6	6.1
Adrenaline	5	5.1
Albumin	5	5.1
Oral rehydration salts	3	3.1
Vitamin K – 2nd dose	2	2.0
Diuretics	2	2.0
Platelets	1	1.0
Kayexalate	1	1.0
Nitrous oxide	1	1.0
Solumedrol	1	1.0
Procedures:		
Mechanical ventilator	93	94.9
Tube through nose	58	59.2
Umbilical catheter	14	14.3
NPO	12	12.2
Echocardiogram	5	5.1
Operation	4	4.1
Thoracic drain	1	1.0

The most common reasons for hospital admission after birth (table 5) were prematurity (34%) respiratory distress (29%) and dyspnea (24%). The most common immediate cause of death (table 6) was cardiac arrest (78%). No autopsies were performed.

Table 5: Reasons for hospital admission of neonates after birth among refugees in UNHCR network hospitals, Lebanon first quarter 2021 (n=98)

Reasons for admissions (more than 1 per neonate)	Number	Percent
Prematurity	33	33.7
Respiratory distress	28	28.6
Dyspnea	23	23.5
Low birth weight	12	12.2
Neonatal infection/sepsis	9	9.2
Cyanosis	8	8.2
Birth asphyxia	8	8.2
Congenital anomaly	8	8.2
Hemorrhage[1]	7	7.3
DIC	5	5.1
Convulsion	3	3.1
Meconium aspiration	3	3.1
Hypotonic	3	3.1
Septic shock	3	3.1
Refusal to suck	2	2.0
Growth retardation	2	2.0
Other reasons[2]	19	19.4

Table 6: Immediate cause of neonatal deaths among refugees in UNHCR network hospitals, Lebanon first quarter 2021 (n=98)

Immediate cause of death	Number	Percent
Cardiac arrest	76	77.6
Hemorrhage	9	9.2
Pulmonary hemorrhage	5	5.1
Intraventricular hemorrhage	1	1.0
Cerebral hemorrhage	1	1.0
Digestive hemorrhage	1	1.0
Hemorrhage	1	1.0
Respiratory distress/failure	6	6.1
Congenital heart disease	4	4.1
Septic Shock	3	3.1
Congenital anomaly	3	3.1
Hemorrhagic shock	2	2.0
DIC	2	2.0
Sepsis/septicemia	2	2.0
Cerebral hypoxia	1	1.0
Severe metabolic acidosis	1	1.0

[1] Hemorrhage includes 3 pulmonary, 2 gastric, 1 brain and I not specified

[2] Other reasons include single cases of blue color, bradycardia, brain death, dehydrated, ecchymosis, intercostal drawing, , hemoptysis, hyperbilirubinemia, hypothermia, ichthyosis, intestinal occlusion, jaundice, kernicterus, plural effusion, renal failure, tachypnea, trisomy 21, umbilical abscess and vomiting

With respect to the reported parental perceptions (table 7), lack of breastfeeding (87%) and breathing problems (81%) were the most common characteristics as perceived by the parents or caretakers. Around a third of the parents (33%) declared that their infants were blue at birth and almost two thirds (61%) perceived that the infant's death was sudden. Forty-four percent (44%) of the parents felt that their infants were abnormally small and 28% had doubts about whether medical care was needed. As for the non-clinical perceptions, there were 31 infants (32%) who were transported to a health facility after birth, of these 15 were transported by ambulance and 4 faced challenges once they were at the health facility. Almost all the parents (97%) felt that the total costs of care and treatment prohibited other household payments and 79% reported using a phone to call for help.

Table 7: Reported parents/caretakers' perceptions of the condition of the neonates prior to death among refugees in UNHCR network hospitals, Lebanon first quarter 2021 (n=98).

Characteristics	Number	Percent
Clinical		
Not breastfed at all	85	86.7
Breathing problems	79	80.6
Sudden death	60	61.2
Abnormally small	43	43.9
Blue at birth	32	32.7
Chest wall pulled	22	22.4
Unresponsive	15	15.3
Discharged ill	15	15.3
Visible malformations	9	9.2
Protruding abdomen	9	9.2
Born 24 hours after water broke	8	8.2
Vomited	8	8.2
Born with bottom and feet first	7	7.1
Macerated	6	6.1
Stopped suckling 3 days after birth	5	5.1
Skin problems	5	5.1
Born with umbilical cord around neck	5	5.1
Fever	4	4.1
Convulsions	3	3.1
Bulging or raised fontanelle	3	3.1
Cold to touch	2	2.0
Non-clinical		
Prohibitive costs	95	96.9
Use of phone	77	78.6
Doubts about treatment	27	27.6
Taken to the health facility	31	31.6
More than 2 hours from hospital	9	9.2
Use of traditional medication	5	5.1
Challenges at center	4	4.1

4.1.3 Maternal Characteristics

Table 8 depicts the characteristics of the refugee mothers that had neonatal deaths in UNHCR network hospitals during the first quarter of 2021 as well as certain characteristics of their delivery experience. The average age was 27 years (SD=6.8) with a minimum of 15 and a maximum of 42 years. Twenty percent (20%) of the women were teenagers and 12% were 35 years or older. On average the gravida and parity in this sample were 3.7 (SD=2.5) pregnancies and 3.3 (SD=2.2) infants respectively. The number of antenatal visits ranged from 1 to 20 visits per pregnancy with an average of 7 visits (SD= 3.8) and a median of 6 visits. There was only one woman who had no antenatal visits but 29% reported having four visits or less and 28% had between five to seven visits. Sixty-six percent (66%) were prescribed iron supplements and 60% were given vitamins.

Most of the cases audited involved singleton births (89%), born in a network hospital (88%) attended by a physician (87%). The average gestational age was 32 weeks (SD=5.0). Sixty-six percent (66%) of the infants were premature with 17% born before the 28th week of pregnancy. Fifty-six percent (56%) of the deliveries were Cesarean sections. There were 3 cases of unassisted spontaneous vaginal deliveries. Fifty-seven percent (57%) of the women reported danger signs with abdominal pain (18 cases) and vaginal bleeding (12 cases) reported 32% and 21% of the time. Thirty-three percent (33%) of the women reported adverse labor events with preterm rupture of the membrane (n=22) reported 67% of the time. Four eight percent (48%) of the women had delivery complications, with unplanned/emergency C-section (n=25) reported around half the time (53%). All the women are alive.

Table 8: Maternal and Delivery Characteristics of neonatal deaths among refugees in UNHCR network hospitals, Lebanon first quarter 2021 (n=98)

Characteristics	Mean ± SD	Min-Max
Age	26.6 ± 6.8	15-42
Gravida	3.7 ± 2.5	1-12
Parity	3.3 ± 2.2	1-10
Antenatal visits	6.9 ± 3.9	0-20
Gestational age	32.8 ± 5.0	22-40
Maternal age (years)	**Number**	**Percent**
<20	20	20.4
20-35	66	67.4
>35	12	12.2
Number of visits		
0	1	1.0
1	4	4.1
2	5	5.1
3	10	10.2
4	8	8.1
5	10	10.2
6	12	12.2
7	5	5.1
8	18	18.4
9	5	5.1
10	9	9.2
11+	11	11.2
Gestational age		
Extremely preterm (< 28 weeks)	17	17.3
Very preterm (28 - 31 weeks)	25	25.6
Moderate preterm (32 - 36 weeks)	23	23.4
Full Term (37 - 42 weeks)	32	32.7
Not documented	1	1.0
Type of pregnancy		
Single	87	88.8
Twin	10	10.2
Triplets	1	1.0
Antenatal care		
Yes	97	99.0
No	1	1.0
Place of birth		
Network Hospital	86	87.8
Referral Hospital	7	7.1
Clinic	3	3.1
Home	1	1.0
On the way	1	1.0
Mode of delivery		
Cesarean Section	55	56.1
Spontaneous Vaginal Delivery (skilled attendant)	40	40.8
Spontaneous Vaginal Delivery (unattended)	3	3.1
Fetal Presentation		
Cephalic	36	36.7
Breech	12	12.2
Transverse	8	8.2
Don't Know	42	42.9

Pregnancy Danger Signs		
Yes	56	57.1
No	42	42.9
Anemia		
Yes	22	22.4
No	76	77.6
Adverse labor events		
Yes	32	32.7
No	66	67.3
Delivery complications		
Yes	47	48.0
No	51	52.0

4.1.4 Risk Factors

The most common medical risk factor was prematurity (66%). Twenty-six percent (26%) of the women had an unplanned C-section delivery and 22% had premature rupture of the membranes.

Table 9: Risk factors for neonatal deaths among refugees in UNHCR network hospitals, Lebanon first quarter 2021 (n=98)

Contributing Risk Factors	Number	Percent
Antenatal complications		
Abdominal pain	18	18.4
Vaginal bleeding	12	12.2
Decreased blood pressure	5	5.1
Decreased fetal movement	4	4.1
Fever	3	3.1
Labor/Delivery related		
C-section delivery (complication)	25	25.5
Premature rupture of membranes	22	22.4
Prolonged ROM	9	9.2
Prolonged obstructed labor	7	7.1
Postpartum hemorrhage	6	6.1
Eclampsia/pre-eclampsia	3	3.1
Cord prolapse	1	1.0
Neonate related		
Prematurity	65	66.3

4.2 Qualitative Findings

In terms of the qualitative comments received from the families, their main concern is a financial one as most families complained of monetary difficulties in accessing care. In addition to the majority (97%) claiming that they felt that the total cost of care and treatment prohibited other household payments (table 7) some parents mentioned delays in admission or treatment provision to either the baby or the pregnant mother until certain fees were paid. Furthermore, in a few cases the parents mentioned that

they were not able to retrieve the deceased neonate's body until they settled their hospital bills. Moreover, a few mothers reported that although they were prescribed medication during their pregnancy, they could not afford to pay for it and therefore did without.

In addition to the financial burdens, parents also complained of delays in reaching the hospital either due to the distance they had to travel or due to heavy traffic conditions. A few expressed some concerns about the treatment that they were receiving in the health facilities (before and during delivery). Although some parents blamed the medical personnel for the fate of their infant, most of the complaints centered on the lack of communication and sparse transmission of information. Once the infant was admitted to the NICU the parents did not receive much feedback about his/her condition and were essentially left in the dark. This was even more critical during the pandemic where some parents were not even allowed to visit the infant due to Covid19 restrictions. Furthermore, the parents' testimonies made it clear that the Covid19 pandemic had taken its toll as in addition to reduced access to the neonate, there were issues with transportation, management of the lockdown and movement restrictions, admissions to the hospital and NICU availability. Parents faced difficulties in finding taxis especially at night due to the curfews imposed. They often had to go to several hospitals before they could finally be admitted due to the surge of Covid19 cases, the demand on respirators and the non-availability of beds. In a few cases, they were even sent back home unless they were on the verge of delivering due to the overload in hospital capacities. In the same vein, infants were also transferred to different hospitals if they required NICU care or surgical attention.

Finally, there are three additional items that are only captured qualitatively that are worthy of mention. First, although all the mothers are alive, some are in fragile emotional states. Second, there were several cases of consanguinity among the parents and third some information was shared on previous deliveries by C-section and a history of miscarriages or infant deaths.

5 Discussion

In the first quarter of 2021, a total of 98 neonatal audits were completed over the 3 months, with an average of 33 neonatal audits per month. Although there is a slight rise in the proportion of premature infants in this quarter, in general, the maternal and infant characteristics of the sample appear to be similar to those reported in the previous year. In this quarter, 55% of the infants were males, sixty-six percent (66%) were premature with an average gestational age of 33 weeks (SD= 5.0) and 64% died within the first week of life. Sixty-nine percent (69%) of the infants had low birth weight with 38% weighing less than 1500g. Of the neonates with low birth weight, 24% were born to adolescent mothers. The mothers were on average 27 years old (SD= 6.8) with a mean gravida of 3.7 pregnancies (SD = 2.5) and parity of 3.3 infants (SD= 2.2). Twenty percent (20%) of the women were below the age of 20 and 12% were above 35. The average number of antenatal visits per pregnancy was 7 visits (SD= 3.9) with a median of 6 visits and 29% having four visits or less.

With regards to the delivery-related characteristics, there was an increase in the proportion of C-section deliveries (56% vs. 44.3%) compared to quarter one last year. In addition, there appears to be a higher proportion of pregnancy danger signs (57% vs. 19.7%), and delivery complications (48% vs. 34.4%) reported in this quarter compared to the previous year quarter one.

It is possible that some of the increase observed could be explained by the improvement in the definition of events or probing during data collection that comes with acquired experience as the neonatal audit moves into its second year. However, the increase could also be due to the Covid19 surge that was experienced in the country during this quarter, the renewed lockdowns imposed on the families and the economic situation which might have delayed access to care that could have prevented some of these situations and complications. These include proper antenatal care to detect but also treat problems, sufficient financial means to undergo the required treatment and timely arrival and admission to hospitals.

Even though UNHCR financially covered deliveries do not represent all deliveries performed in Lebanon for refugees, they constitute around 80-90% of deliveries

among refugee populations which allows for the calculation of neonatal mortality rates per region. Although the highest number of deaths occurred in the Bekaa region, these appear to be the lowest neonatal mortality rates per 1000 live births in the country. The rates for this quarter for the South, North, BML and Bekaa were respectively 13.59, 12.69, 11.78 and 11.15. The picture was quite different a year ago when the neonatal audit exercise was started. In comparison, the rates in the first quarter of 2020 were much lower in all regions with the highest rates in the Bekaa and the lowest in the North regions. The rates per area at the time were 12.23 per 1000 live births for the Bekaa, 9.50 for the South, 7.25 for BML and 6.70 for the North. In general, the rates per region this quarter are lower than those observed during the third quarter of 2020 where the highest rates per 1000 live births were for the Bekaa (20.45) and the lowest for the South (13.99) with rates of 20.30 for the North and 20.02 for BML but except for the rates in BML, they are in line with those of the fourth quarter of 2020 with rates of 12.31 in the Bekaa, 14.85 in the South, 13.52 in the North and 8.9 in BML except for the latter. It appears as if there is a decreasing trend in the hospital neonatal mortality rates in the Bekaa and an increasing trend in the rates in the South. A possible explanation for the decrease in NNMR in the Bekaa could be that less cases of neonatal deaths are occurring in the hospitals as opposed to clinics or at home. As for the increase in cases in the South it could be due to the oversaturation of hospitals in Beirut with Covid19 cases and as a result more referrals of cases to hospitals in the South that were less involved with managing the pandemic.

Both the quantitative and qualitative findings in this report shed light on the need to better address antenatal care options available to the pregnant women, transportation to the hospital especially for delivery, interpersonal communication with hospital personnel and potential delays in receiving care due to financial problems and lengthy administrative procedures. Although the audit form does not allow proper capture of some sociodemographic and pregnancy related information, given the proportion of women in the sample that are below the age of 20 years and the proportion of low-birth-weight infants that are attributed to these mothers it appears to be particularly important to target these women for discussions on proper antenatal care, the risks of early marriage, adolescent pregnancies and lack of birth spacing.

5.1 Limitations

The findings of the current report must be interpreted considering some limitations. The population of interest for this audit is captured from the UNHCR hospitals network; hence, only neonatal mortalities occurring in the network hospitals are reported in this audit. Any neonatal mortality occurring in other settings (hospitals outside the network and home mortalities) are not captured. Although the latter is valid, the number of deliveries, neonatal admissions, and neonatal mortalities occurring in the hospitals network are representative of the total refugee mortalities in Lebanon.

In addition, the current audit captures mortalities of neonates below 28 days of age; the sample for data collection does not include stillbirth cases which in turn restricts the overall findings on the health care services and the quality of care received by the refugee population.

The current audit did not capture several important variables that would feed into the analysis of the preventable factors leading to neonatal mortality and the quality of health care services provided to the pregnant women. Those include data on length of stay, discharge date, time of birth, early marriage, spacing, etc. Moreover, the audit was not able to single out the challenges faced by the parents due to the Covid19 pandemic which influenced both the access to and availability of health services and as a result on neonatal mortality.

5.2 Challenges

The field investigators faced some difficulties in terms of scheduling the interviews at a convenient time and finding that the parents were often not able to provide the information requested, especially if the child was moved to the ICU at birth and remained there until death. The field investigators used the hospital files to complete the information provided by the parents when there were gaps. It is noteworthy that the hospital files tended to be incomplete when the infant was born elsewhere and not all hospitals allowed the investigators access to the medical records or hospital personnel.

Due to the safety measures required by the Covid19 pandemic, all the data collection was done by phone. For ethical purposes, the data was collected first from the parents and then upon their permission from the hospitals. All the parents agreed to allow the field investigators to access their medical records and the TPA delegates were generally helpful in acquiring the documents from the hospitals. When the hospitals refused to grant access to their records the field investigators made use of the information in the TPA files.

The UNHCR neonatal audit process is in its infancy in Lebanon as it was launched in December 2019. Except for a few challenges faced in obtaining the cooperation of some of the hospitals, the process itself has been relatively smooth. However, the data collection form needs to be better tailored to the refugee population in Lebanon. Areas that warrant additional probing include details about antenatal care visits especially since, in the around half of the cases, the deliveries appear to have no adverse labor events and no complications.

The challenges faced by the team in terms of the data collection process included inaccurate parental contact information, inability to access medical records in certain areas and particular hospitals and inconsistent information between the medical files and the parents' reports especially pertaining to the gestational age of the newborn. As for the form itself, there were problems with certain questions in terms of options and definitions and challenges with skip patterns and consistency checks. Moreover, there were some difficulties in meeting the 72-hour time restriction considering the schedules and workload of the medical personnel in the era of Covid19 as well as the spread of the disease which affected several the respondents. There were also delays in processing the audits at the coordinator level for administrative reasons.

6 Conclusions and Recommendations

In conclusion, several recommendations can be suggested based on the challenges faced on the field, data completeness and reporting and the actual findings.
With respect to completeness of the form and uniformity of the information:

1. Revise the form in terms of consistency and flow of information

2. Provide training for interviewers on standardized definitions and the type and volume of qualitative information required
3. Train health personnel on the necessity of having complete information pertaining to the birth of the neonate including birth weight and Apgar scores.
4. Standardize physician's reporting of immediate and underlying causes of death.
5. Meet with experts to set up a standard list of risk factors to look out for and report in a consistent manner.

With respect to the findings of the report:

1. Provide community education sessions for raising the awareness of women on the importance of proper antenatal care as well the risks of early marriage, adolescent pregnancies and lack of birth spacing.
2. Brainstorm to develop options for timely and affordable transportation to the hospital.
3. Offer workshops for hospital personnel that address interpersonal relations and communication issues within the hospital and with the parents.
4. Consider package of care for pregnant women to encourage timely attendance of ANC and PNC visits, including financial incentives, such as full coverage of deliveries for those complete 8 ANC visits, etc.
5. Expand the questionnaire to allow for in-depth exploration of factors related to the mother's reproductive history and pregnancy experience to inform on the reason for premature babies, limited access to care, delay to care, quality of care, prohibitive costs, etc.
6. Facilitate UNHCR administrative procedures to expedite hospital admission and discharge processes to avoid delays in care, confiscation of IDs upon discharge and detention of the deceased infant's body.