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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 122 neonatal deaths audited between April 1st and June 30th 2021, and were included in this report. There was a 24% increase in neonatal mortalities reported in quarter two, compared to quarter one of 2021, also higher when compared to last year second quarter (107 NNMs in Q.2 2020). Results for this quarter show that for the first time since the inception of the neonatal mortality process among the refugee population in Lebanon, the proportion of audited mortalities in the South equals that in the Bekaa with around a third being performed in each region. Similar to quarter one of 2021, the neonatal mortality rate for the Bekaa remains the lowest among the four regions in the country with rates ranging from 13.87 deaths per 1000 live births in the Bekaa to 21.57 deaths per 1000 live births in the South. Moreover, all the neonatal mortality rates for this quarter are higher than the recommended target of less than 12 deaths per 1000 live births by 2030. The fluctuations in rates and variations in trends emphasize the need for neonatal audits in an effort to better understand the situation and implement measures to reduce the neonatal mortality rates to the recommended values.

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 is in contrast to 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 851,717registered with UNHCR as of end of May 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.;

[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 certificates;
- 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, 33 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: 4 hospitals in ML and 3 hospitals in Beirut
- South: 7 hospitals

Not all of the 33 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 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 flagged 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 117 alerts, 36 in April, 41 in May and 40 in June, were received between April 1, 2021 and June 30, 2021 (quarter two) of 2021. Of these, four were for March deaths (already included in quarter one of 2021) and three were not done because of parental refusal for two cases and duplication for the third. In addition, there were twelve June deaths with alerts received in July. Therefore, a total of 122 infant deaths among refugees using UNHCR network hospitals in Lebanon were audited during quarter two of 2021. Two thirds (67%) of the hospital-based neonatal deaths among refugees in Lebanon occurred in the Bekaa (34%) and the South (33%) while only 12% occurred in BML (table 1).

Table 1: Distribution of neonatal deaths among refugees in UNHCR network hospitals by region, Lebanon second quarter 2021 (n=122)

Region	Number	Percent	Live Births	NNMR[1]	Total Registered Refugees[2]
Bekaa	42	34.4	3028	13.87	334,668
South	40	32.8	1854	21.57	92,493
North	26	21.3	1703	15.26	230,601
BML	14	11.5	975	14.35	197,410

Only 15 of the 33 network hospitals reported refugee neonatal deaths between April 1, 2021 and June 30, 2021. The majority of the cases (85%) in the South and two thirds of the cases in the Bekaa (67%) came from 2 hospitals in each governorate (table 2) while two thirds of the cases in the North and more than half in BML came for one hospital in each governorate. It is important to note that some hospitals in UNHCR

[1] Total neonatal deaths/total deliveries*1000

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

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 highest number of neonatal mortalities was 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 the BML area which in turn increase the number of NNM in comparison to other areas. Although the South holds 11% of the refugee population, the hospitals in South received 33% of the total referrals in quarter two of 2021 (mainly from BML) corresponding to the high proportion of mortalities.

Table 2: Distribution of neonatal deaths among refugees in UNHCR network hospitals by hospital, Lebanon second quarter 2021 (n=122)

Hospital Code	Neonatal death	Percent	Live Births	Neonatal Admission
S01	18	14.8	608	106
S02	16	13.1	669	120
N02	15	12.3	355	54
Bek03	14	11.6	476	107
Bek02	14	11.6	1407	106
ML01	9	7.4	317	28
Bek04	8	6.6	424	54
Bek01	6	4.9	330	58
N01	4	3.2	266	23
N04	4	3.2	153	38
S03	4	3.2	332	56
B01	3	2.5	389	42
N05	2	1.6	280	25
S04	2	1.6	195	26
ML04	2	1.6	56	13
N03	1	0.8	0	12

4.1.2 Characteristics of Neonatal Deaths

Table 3 describes the characteristics of 122 Syrian neonatal death audited among refugees in UNHCR network hospitals in Lebanon during the second quarter of 2021. Sixty percent (60%) of the infants died within 7 days of birth and 62% were males. Where documented, the majority of the infants had no umbilical infection (97%), 87% required resuscitation and 76% were given vitamin K at birth. Sixty-six percent (66%) of the infants had low birth weight with 37% weighing less than 1500g. Of the neonates

with low birth weight, 85% were premature and 15% were born to adolescent mothers. The mean Apgar score was 4.2 with a standard deviation of 2.3 at 1 minute and 5.2 with a standard deviation of 2.1 at 5 minutes. Note that Apgar scores at 1 and 5 minutes were not documented in 24% and 34% of the cases respectively.

The majority of the infants (93%) were placed on a mechanical ventilator and given parenteral antibiotics (91%) at birth (Table 4). In addition, 89% were provided with IV fluids and 75% were intubated. Sixty-two percent (62%) of the neonatal deaths were admitted to hospital after birth with around two thirds (64%) being internal referrals to the NICU. Thirteen (13) cases (17% of those admitted) were hospital to hospital transfers at birth.

Table 3: Characteristics of the neonatal deaths among refugees in UNHCR network hospitals, Lebanon second quarter 2021 (n=122).

Characteristic	Number	Percent
Gender		
Male	76	62.3
Female	46	37.7
Age at time of Death		
< 24 hrs.	10	8.2
1-2 days	33	27.0
3-6 days	30	24.6
7-13 days	34	27.9
14-20 days	7	5.7
21-27 days	8	6.6
Low birth weight (≤ 2500)		
Yes	80	65.6
No	37	30.3
Not documented	5	4.1
Birth weight classification		
Extremely low birth weight ≤ 1000 gm	14	11.5
Very low birth weight 1001-1500 gm	31	25.4
Moderate low birth weight 1501 -2500	35	28.7
Normal birth weight > 2500 gm	37	30.3
Not documented	5	4.1
Resuscitation required		
Yes	99	81.1
No	15	12.3
Not documented	8	6.6
Umbilical infection		
Yes	3	2.5
No	103	84.4
Not documented	16	13.1
Prophylaxis (more than 1)		
Vitamin K	81	66.4
Eye ointment	60	49.2

Surfactant	38	31.1
None	14	11.5
Not documented	16	13.1
Characteristics	**Mean ± SD[1]**	**Min-Max**
Apgar Scores		
1 minute (n=93)	4.2±2.3	0-9
5 minutes (n=80)	5.2±2.1	0-10

Table 4: Interventions provided at admission among refugees in UNHCR network hospitals, Lebanon second quarter 2021 (n=122)

Interventions provided (more than 1 per neonate)	Number	Percent
Medications:		
Parenteral antibiotics	111	91.0
IV fluids	108	88.5
Vaccines	35	28.7
Oxygen	27	22.1
Transfusion	21	17.2
Fresh frozen plasma	21	17.2
Phototherapy	15	12.3
Parenteral anticonvulsants	12	9.8
Procedures:		
Mechanical ventilator	113	92.6
Tube through nose	92	75.4
NPO	17	13.9
Umbilical line/catheter	11	9.0
Echocardiogram	7	5.7
Operation	5	4.1
Brain CT	4	3.3
Thoracic drain	1	0.8
Undocumented	3	2.5

The most common reasons for hospital admission after birth (table 5) were respiratory distress (29%), prematurity (25%) and dyspnea (17%). The main immediate cause of death (table 6) was cardiac arrest (91%). No autopsies were performed.

[1] SD = standard Deviation

Table 5: Reasons for hospital admission of neonates after birth among refugees in UNHCR network hospitals, Lebanon second quarter 2021 (n=122)

Reasons for admissions (more than 1 per neonate)	Number	Percent
RDS/HMD	35	28.7
Prematurity	31	25.4
Dyspnea	21	17.2
Congenital anomaly	15	12.3
Neonatal infection/sepsis	8	6.7
Cyanosis	6	4.9
Pneumonia	5	4.1
Convulsion	4	3.3
Low birth weight	3	2.5
Hypotonic	3	2.5
Jaundice	3	2.5
Pneumothorax	3	2.5
Bilateral mydriasis	3	2.5
Pulmonary hypertension	3	2.5
Birth asphyxia	2	1.6
Refusal to suck	2	1.6
Fever	2	1.6
Cardiac arrest	2	1.6
Hypoxia	2	1.6
Hemorrhage	2	1.6
Meconium aspiration	2	1.6
Other	18	14.8

Table 6: Immediate cause of neonatal deaths among refugees in UNHCR network hospitals, Lebanon second quarter 2021 (n=122)

Immediate cause of death	Number	Percent
Cardiac arrest	111	91.0
Hemorrhage	6	4.9
Congenital anomaly/CHD	4	3.3
Septic Shock	4	3.3
Sepsis/septicemia	3	2.5
DIC	2	1.6
Other	8	6.6

With respect to the reported parental perceptions (table 7), lack of breastfeeding (89%) and breathing problems (75%) were the most common characteristics as perceived by the parents or caretakers. Around a third of the parents (32%) declared that their infants were blue at birth and two thirds (66%) perceived that the infant's death was sudden. Forty percent (40%) of the parents felt that their infants were abnormally small. As for the non-clinical perceptions, there were 26 infants (21%) who were transported to a health facility after birth, of these 14 were transported by ambulance and 5 faced challenges once they were at the health facility. Almost all the parents

(95%) felt that the total costs of care and treatment prohibited other household payments and 70% reported using a phone to call for help. A third (33%) had doubts about whether medical care was needed.

Table 7: Reported parents/caretakers' perceptions of the condition of the neonates prior to death among refugees in UNHCR network hospitals, Lebanon second quarter 2021 (n=122).

Characteristics	Number	Percent
Clinical		
Not breastfed at all	108	88.5
Breathing problems	92	75.4
Sudden death	80	65.6
Abnormally small	49	40.2
Blue at birth	39	32.0
Chest wall pulled	25	20.5
Unresponsive	17	13.9
Macerated	14	11.5
Discharged ill	11	9.0
Protruding abdomen	11	9.0
Born 24 hours after water broke	11	9.0
Skin problems	11	9.0
Visible malformations	9	7.4
Born with bottom and feet first	8	6.6
Fever	7	5.7
Vomited	6	4.9
Born with umbilical cord around neck	6	4.9
Convulsions	5	4.1
Cold to touch	4	3.3
Cough	4	3.3
Stopped suckling 3 days after birth	3	2.5
Diarrhea	3	2.5
Bulging or raised fontanelle	3	2.5
Non-clinical		
Prohibitive costs	116	95.1
Use of phone	85	69.7
Doubts about treatment	40	32.8
Taken to the health facility	26	21.3
More than 2 hours from hospital	7	5.7
Challenges at center	5	4.1
Use of traditional medication	2	1.6

4.1.3 Maternal Characteristics

Table 8 depicts the characteristics of the refugee mothers that had neonatal deaths in UNHCR network hospitals during the second quarter of 2021 as well as certain characteristics of their delivery experience. The average age was 27 years (SD=6.4) with a minimum of 15 and a maximum of 42 years. Sixteen percent (16%) of the women were teenagers and 10% were older than 35. On average the gravida and

parity in this sample were 3.8 (SD=2.2) pregnancies and 3.2 (SD=1.9) infants respectively. The number of antenatal visits ranged from 1 to 63 visits per pregnancy with an average of 10 visits (SD= 9.2) and a median of 8 visits. Twenty-two percent of the women reported four visits or less and 22% had more than 10 visits. Of the latter 27 women, 3 were older than 35, 2 were younger than 20, 10 had twin or triplet pregnancies, 17 delivered by C-section, 3 reported a history of miscarriage, 5 had vaginal bleeding and 4 elevated blood pressure. There were three women who claimed having one visit per week during their pregnancy. The woman with 63 visits was taken to the doctor 10 times per week when she was having vaginal bleeding. Seventy-one percent (71%) were prescribed iron supplements and 80% were given vitamins.

Most of the cases audited involved singleton births (78%), born in a network hospital (93%) and attended by a physician (87%). The average gestational age was 33 weeks (SD=5.2). Sixty-five percent (65%) of the infants were premature with 21% born before the 28th week of pregnancy. Fifty-seven percent (57%) of the deliveries were Cesarean sections. There were two cases of unassisted spontaneous deliveries and one case of assisted vaginal deliveries. Fifty-two percent (52%) of the women reported danger signs with abdominal pain (22 cases) and vaginal bleeding (17 cases) reported 35% and 27% of the time. Thirty percent (30%) of the women reported adverse labor events with preterm rupture of the membrane (n=26) reported 72% of the time. Thirty-two percent (32%) of the women had delivery complications, with unplanned/emergency C-section (n=24) reported around a third of the time (62%). All the women are alive.

Table 8: Maternal and Delivery Characteristics of neonatal deaths among refugees in UNHCR network hospitals, Lebanon second quarter 2021 (n=122)

Characteristics	Mean ± SD	Min-Max
Age	26.7±6.4	15-42
Gravida	3.8±2.2	1-11
Parity	3.2±1.9	1-9
Antenatal visits	9.9±9.2	1-63
Gestational age	32.8±5.2	1-40
Maternal age (years)	**Number**	**Percent**
<20	19	15.6
20-35	91	74.6
>35	12	9.8
Number of visits		
1	2	1.6

2	5	4.1
3	7	5.7
4	13	10.7
5	5	4.1
6	13	10.7
7	7	5.7
8	17	13.9
9	12	9.8
10	14	11.5
11+	27	22.2
Gestational age		
Extremely preterm (< 28 weeks)	25	20.5
Very preterm (28 - 31 weeks)	29	23.8
Moderate preterm (32 - 36 weeks)	25	20.5
Full Term (37 - 42 weeks)	43	35.2
Not documented		
Type of pregnancy		
Single	95	77.9
Twin	22	18.0
Triplets	5	4.1
Antenatal care		
Yes	122	100.0
No	0	0.0
Place of birth		
Network Hospital	113	92.6
Referral Hospital	3	2.5
Clinic	4	3.3
On the way	2	1.6
Mode of delivery		
Cesarean Section	70	57.4
Spontaneous Vaginal Delivery (skilled attendant)	49	40.2
Spontaneous Vaginal Delivery (unattended)	2	1.6
Assisted Vaginal Delivery	1	0.8
Fetal Presentation		
Cephalic	54	44.3
Transverse	9	7.4
Breech	7	5.7
Don’t Know	52	42.7
Pregnancy Danger Signs		
Yes	63	51.6
No	59	48.4
Anemia		
Yes	32	26.2
No	90	73.8
Adverse labor events		
Yes	36	29.5
No	86	70.5
Delivery complications		
Yes	39	32.0
No	83	68.0

4.1.4 Risk Factors

The most common medical risk factor was prematurity (65%). Twenty-one percent (21%) of the women had premature rupture of the membranes and 20% had a C-section as a delivery complication. Fourteen percent (14%) of the women complained of vaginal bleeding during pregnancy.

Table 9: Risk factors for neonatal deaths among refugees in UNHCR network hospitals, Lebanon second quarter 2021 (n=122)

Contributing Risk Factors	Number	Percent
Antenatal complications		
Abdominal pain	22	18.0
Vaginal bleeding	17	13.9
Elevated blood pressure	9	7.4
Glycosuria	4	3.3
Decreased fetal movement	3	2.5
Fever	3	2.5
Seizures	3	2.5
Decreased blood pressure	2	1.6
Labor/Delivery related		
Premature rupture of membranes	26	21.3
C-section delivery (complication)	24	19.7
Postpartum hemorrhage	5	4.1
Prolonged ROM	2	1.6
Prolonged obstructed labor	2	1.6
Eclampsia/pre-eclampsia	1	0.8
Cord prolapse	1	0.8
Neonate related		
Prematurity	79	64.8

4.2 Qualitative Findings

In terms of the qualitative comments received from the families, it would appear that their main concern is a financial one as most families complained of monetary difficulties in accessing care. In addition to the majority (95%) 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, several parents mentioned that they were not able to retrieve the deceased neonate's body and even had their IDs withheld 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 due to difficulties with finding transportation. Parents faced difficulties in finding taxis especially at night. Moreover, there were several cases where the parents were rejected from one hospital to the next due to lack of space or the necessary equipment.

A few parents expressed some concerns about the treatment that they were receiving in the health facilities (before, during and after delivery). Some parents blamed the medical personnel for the fate of their infant and the poor treatment that the mother received. In addition, there were several instances where the parents did not know what happened to their child.

The qualitative accounts also point to the need for postnatal counseling and guidance for both the mother and infant. The few infants that were discharged were not taken for the recommended medical visits and only showed up if there was a problem with the infant's health. Most infants returned to the hospitals with infections and dehydrated and there was even one case where the infant died due to trauma inflicted by an older sibling. Moreover, although all the mothers are alive, some are in fragile emotional states.

Finally, some respondents also shared information on antenatal visits and histories of previous pregnancies. These included being asked for certain tests, previous deliveries by C-section and any history of miscarriages or infant deaths. Moreover, there were a number of cases of consanguinity among the parents.

5 Discussion

In the second quarter of 2021, a total of 122 neonatal audits were completed over the 3 months. The increase in the number of deaths relative to the first quarter (122 Vs 98) is similar to that observed last year and could be part of a seasonal trend whereby the least number of deaths are observed in the first quarter. However, since this is only the second year of the neonatal audit among the refugee population in Lebanon, more data would be necessary to confirm this pattern.

In general, the maternal and infant characteristics of the sample appear to be similar to those reported in the previous year. Although there were slightly more males this quarter relative to other reports (62% vs 55%), 65% were premature with an average gestational age of 33 weeks (SD= 5.2) and 60% died within the first week of life. Sixty-six percent (66%) of the infants had low birth weight with 37% weighing less than 1500g. The mothers were on average 27 years old (SD= 6.4) with a mean gravida of 3.8 pregnancies (SD = 2.2) and parity of 3.2 infants (SD= 1.9). There were slightly less younger mothers with 16% less than 20 in this quarter as opposed to 20% in the previous reports. Similarly, the proportion of teenage mothers among low birth weight infants is also lower this quarter (15% vs 24%). The proportion of older mothers remained the same with 10% being older than 35 years. On average there were more antenatal care visits reported this quarter with a mean of 10 visits (SD=9.2), a median of 8 visits and 22% having four visits or less. However, there were a few extreme cases who reported one or more visits per week during pregnancy mostly due to vaginal bleeding or other danger signs.

The more prevalent risk factors remain the same namely prematurity, C-section as a delivery complication and premature rupture of the membrane as an adverse labor event. More work is being done to allow for a better investigation of risk factors. In fact, a detailed list of risk factors has been developed, is under discussion and will soon be incorporated within the data collection tool.

For the first time since the inception of this neonatal audit process, the proportion of audits performed in the South (33%) is the same as that in the Bekaa (34%). This in accordance with the decreasing trend in the hospital neonatal mortality rates in the

Bekaa and the increasing trend in the rates in the South that were reported last quarter. One possible explanation is that hospitals in the South are receiving more referral cases from Beirut hospitals that are struggling with the repercussion from the pandemic and the dire economic situation which has caused a large depletion in human resources and medical equipment.

Even though UNHCR financially covered deliveries do not represent all deliveries, they constitute around 80-90% of deliveries among refugee populations which allows for the calculation of neonatal mortality rates per region. The neonatal mortality rates for this quarter for the South, North, BML and Bekaa were respectively 21.57, 15.26, 14.35 and 13.87, exceeding the SDG target of <12/ 1000 LB. In general, the rates per region this quarter are considerably higher than those observed during the first quarter of 2021 (13.59, 12.69, 11.78 and 11.15). The rates for the South and Bekaa are in fact more in line with those observed during the third quarter of 2020 but in reverse; the highest rates per 1000 live births during the third quarter of 2020 were 20.45 for the Bekaa and 13.99 for the South. As for the rates in the North and BML for this quarter, they are lower than those of quarter three 2020 for these areas (20.30 for the North and 20.02 for BML).

It is possible that some of the increases in neonatal deaths observed could be explained by 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.

5.1 Limitations

The findings of the current report must be interpreted in light of 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 a number of 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.

5.2 Challenges

The team is still facing challenges pertaining to inaccurate parental contact information, inability to access medical records in certain areas and particular hospitals and missing or inconsistent information in the medical files when compared to the parents' reports. However, these problems are found to a lesser extent than in previous quarters.

Due to the safety measures required by the Covid19 pandemic, all of the data collection is still being collected by phone. Although all the parents except one agreed to allow the field investigators to access their neonates' medical records there were a couple of hospitals that refused to grant access to the records and the field investigators had to make use of the information in the TPA files.

As for the form it is still a work in progress and needs to be better tailored to the refugee population in Lebanon. Particular areas that warrant additional probing include details about antenatal care visits and history of earlier pregnancies especially since, in more than two thirds of the cases, the deliveries appear to have no adverse labor events and no complications. There were also problems with certain questions in terms of options and definitions and challenges with skip patterns and consistency checks. Some work has already been done on standardizing risk factors and immediate/underlying causes of death. Although not yet incorporated on the form, they have been shared with the interviewers who try to incorporate some of this information in the qualitative sections. In addition, individual interviewer debriefing sessions are planned for August and an interviewer refresher session is planned for September.

Finally, in terms of logistics, there were some difficulties in meeting the 72-hour time restriction considering the schedules and workload of the medical personnel. Moreover, there were delays in processing the audits at the coordinator level for administrative reasons. Some challenges were also faced due to electricity shortages and weak internet connections. As a result, there were delays in submitting files to Kobo and issues with lagging applications while working online. There were a few glitches where submitted files would disappear only to reappear at a later time. Additional precautions needed to be put in place such as backing up the Kobo files

more often and asking the field investigators to send emails when they submitted their files. More will be done on automating the process during the next quarter in order to reduce delays in processing wherever possible.

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 and post-natal care as well the risks of consanguinity, early marriage, adolescent pregnancies and lack of birth spacing.
2. Brainstorm to develop options for timely referrals 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. 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.
5. 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.