



Neonatal Death Audit Analysis Report
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TABLE OF CONTENTS

<i>Executive Summary</i>	4
1 Background	5
2 Objectives.....	7
3 Methodology.....	7
4 Results.....	8
4.1 Quantitative Findings.....	8
4.1.1 <i>Distribution of Neonatal Deaths</i>	8
4.1.2 <i>Characteristics of Neonatal Deaths</i>	10
4.1.3 <i>Maternal Characteristics</i>	14
4.1.4 <i>Risk Factors</i>	16
4.2 Qualitative Findings.....	16
5 Discussion.....	18
5.1 Limitations	19
5.2 Challenges.....	20
6 Conclusions and Recommendations.....	21

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 114 neonatal deaths audited between July 1st and September 30th 2021 were included in this report. Results for this quarter show that the proportion of audited mortalities in the South equals that in the Bekaa with around a third being performed in each region. With the exception of the South all neonatal mortality rates for this quarter are lower than the third Sustainable Development Goal (SDG3) of less than 12 deaths per 1000 live births by 2030. The neonatal mortality rates for this quarter range between 8.85 for BML and 13.54 for South Lebanon. 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 2030¹. 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 periods².

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 babies³. 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 mortality⁴. Neonatal mortality audit is particularly important as care often falls between different providers and even between different departments or units^{5,6}.

The Syrian refugee population in Lebanon since 2011, remains the largest concentration of refugees per capita and the fourth largest refugee population in the world⁷. It is estimated by the Lebanese government to be around 1.5 million refugees, with 851,717 registered with UNHCR as of end of May 2021. A higher neonatal mortality rate, above the SDG target, is observed among the Syrian refugee population

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 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>

⁴ <http://www.who.int/pmnch/knowledge/publications/summaries/ks27/en/>

⁵ 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

⁶ Buchmann E.J. (2014). Towards greater effectiveness of perinatal death audit in low- and middle-income countries. *BJOG* 121 (Issue Supplement s4): 134–136

⁷ <https://www.unhcr.org/lb/wp-content/uploads/sites/16/2018/12/VASyR-2018.pdf>

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.

Since October 2019, Lebanon has been witnessing a sequence of crises including the social uprising, economic and financial deterioration, the COVID-19 pandemic, the August 2020 explosion and numerous security incidents that have affected the country and further exacerbated the social, economic, financial, and health conditions of all residents in the country including the refugees.

During the third quarter (June – September) of 2021, the country experienced further deterioration in its economic and financial situation as a result of the devaluation of its currency, the rise in the dollar exchange rate and the progressive decrease in governmental subsidies on essential goods such as fuel, gas, medication and some food items. Therefore, in addition to the already difficult conditions faced in previous quarters, during this quarter, the country experienced a major fuel shortage which hampered transportation as well as the provision of electricity from both governmental and private generator sources.

Fuel shortages drastically impacted hospitals and health facilities as they faced major challenges in securing fuel to operate their facilities; some hospitals were forced to close wards to make sure that the amount of fuel available would sustain the facility for a longer period. Health care facilities voiced out their concerns and worried about being forced to shut down due to fuel shortages. In addition, the fluctuation in the exchange rate and deterioration of the Lebanese currency in addition to cash flow restriction on the US Dollars have placed additional constraints on health facilities capacity to purchase medical supplies, medical gas, medications, and other needed medical items. Stock outs were reported by many hospitals including normal saline, syringes, medications, etc. Medical human resources were released from their employment due to the financial crisis, many migrated abroad while others transitioned to a different field of work looking for better salaries to cover their daily expenses. The remaining health personnel faced challenges in reaching the facilities due to the shortage of fuel.

Access of all residents of Lebanon including refugees as a vulnerable group to care whether prenatal, delivery, or postnatal care was delayed or denied with no means for coverage of the cost of care. Primary Health Care Centers (PHCCs), and other facilities were lacking during this quarter. If available, the cost of medications was high and consequently not affordable further impacting the health conditions. As fuel became scarce in the country, cost of transportation increased amplifying the limitation in access to services on the residents of Lebanon and refugees more specifically.

All the above put together, placed population, including refugees, under the increased risk of limited access to healthcare services and deterioration of their health condition. Moreover, if access was obtained the restricted quality of health care services was a high concern due to the lack of resources.

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.;
- 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.

4 Results

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, 32 hospitals in the network. These are distributed as follows:

- Beqaa: 8 hospitals
- North: 10 hospitals
- BML: 4 hospitals in ML and 3 hospitals in Beirut
- South: 7 hospitals

However, not all of the 32 hospitals on the UNHCR hospital network list have neonatal units and therefore, some might not contribute any eligible cases for this audit.

4.1 Quantitative Findings

[4.1.1 Distribution of Neonatal Deaths](#)

A total of 132 alerts, 52 in July, 45 in August and 35 in September, were received between July 1, 2021 and September 30, 2021 (quarter three) of 2021. Of these twelve were for June deaths (already included in quarter one of 2021) and seven were not done; six because the infants were older than 28 days and one was a duplicate case. In addition, there was one September death whose alert was received in October. Therefore, a total of 114 infant deaths among refugees using UNHCR network hospitals in Lebanon were audited during quarter three 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 11% occurred in BML (table 1).

Table 1: Distribution of neonatal deaths among refugees in UNHCR network hospitals by region, Lebanon third quarter 2021 (n=114)

Region	Number	Percent	Live Births	NNMR ¹	Total Registered Refugees ²
Bekaa	39	34.2	3793	10.28	334,109
South	38	33.3	2807	13.54	92,039
North	25	21.9	2232	11.20	230,078
BML	12	10.5	1356	8.85	195,491

Only 16 of the 32 network hospitals reported refugee neonatal deaths between July 1, 2021 and September 30, 2021. 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 these hospitals in comparison to other hospitals.

As depicted in Table 1, the number of neonatal mortalities reported in South Lebanon, where the lowest number of refugee population resides, was among the highest. This might be attributed to the fact that hospitals in South Lebanon receive many referrals from the BML area which in turn increase the number of NNM in comparison to other areas. Out of the 38 neonatal mortalities in South contracted hospitals, 22 (58%) were among refugees residing in BML; (19 who delivered in South hospitals and 3 delivered in BML hospitals and were transferred to South Hospitals for NICU).

Table 2: Distribution of neonatal deaths among refugees in UNHCR network hospitals by hospital, Lebanon third quarter 2021 (n=114)

Hospital Code	Neonatal death	Percent	Live Births	Percent Live Births	Neonatal Admission	Percent NN admission
S01	22	19.3	946	9.3	160	13.9
N02	16	14.0	560	5.5	72	6.2
Bek03	16	14.0	685	6.7	143	12.4
Bek02	13	11.4	1931	19.0	89	7.7
S02	10	8.8	1031	10.1	171	14.8
Bek04	10	8.8	525	5.2	70	6.1
ML01	6	5.3	408	4.0	69	6.0
B01	5	4.4	566	5.6	55	4.8
N01	3	2.6	252	2.5	44	3.8
S03	3	2.6	430	4.2	49	4.2
S04	3	2.6	259	2.5	27	2.3

¹ Total neonatal deaths/total deliveries*1000

² <http://data2.unhcr.org/en/situations/syria/location/71>

N05	2	1.8	403	4.0	36	3.1
N03	2	1.8	28	0.3	3	0.3
N04	1	0.9	204	2.0	15	1.3
B03	1	0.9	0	0.0	1	0.0
N06	1	0.9	183	1.8	22	1.9

4.1.2 Characteristics of Neonatal Deaths

Table 3 describes the characteristics of 114 Syrian neonatal death audited among refugees in UNHCR network hospitals in Lebanon during the third quarter of 2021. Sixty-three percent (63%) of the infants died within 7 days of birth and 61% were males. Where documented, all infants had no umbilical infection, 90% required resuscitation and 73% were given vitamin K at birth. Seventy-four percent (74%) of the infants had low birth weight with 39% weighing less than 1500g. Of the neonates with low birth weight, 89% were premature and 20% were born to adolescent mothers. The mean Apgar score was 4.9 with a standard deviation of 2.1 at 1 minute and 6.0 with a standard deviation of 2.1 at 5 minutes. Note that 23 to 25% of the Apgar scores at 1 and 5 minutes were not documented.

Table 3: Characteristics of the neonatal deaths among refugees in UNHCR network hospitals, Lebanon third quarter 2021 (n=114).

Characteristic	Number	Percent
Gender		
Male	69	60.5
Female	45	39.5
Age at time of Death		
< 24 hrs.	10	8.8
1-2 days	24	21.1
3-6 days	38	33.3
7-13 days	29	25.4
14-20 days	9	7.9
21-27 days	4	3.5
Low birth weight (≤ 2500)		
Yes	84	73.7
No	25	21.9
Not documented	5	4.4
Birth weight classification		
Extremely low birth weight ≤ 1000 gm	18	15.8
Very low birth weight 1001-1500 gm	25	21.9
Moderate low birth weight 1501 -2500	41	36.0
Normal birth weight > 2500 gm	25	21.9
Not documented	5	4.4
Resuscitation required		
Yes	97	85.1
No	11	9.7
Not documented	6	5.3

Umbilical infection		
Yes	0	0.0
No	105	92.1
Not documented	9	7.9
Prophylaxis (more than 1)		
Vitamin K	76	66.7
Eye ointment	53	46.5
Surfactant	38	33.3
None	14	12.3
Not documented	10	8.8
Characteristics	Mean ± SD¹	Min-Max
Apgar Scores		
1 minute (n=88)	4.9±2.1	0-10
5 minutes (n=85)	6.0±2.1	0-10

The majority of the infants (90%) were placed on a mechanical ventilator and given parenteral antibiotics (97%) at birth (Table 4). In addition, 93% were provided with IV fluids and 79% were intubated.

Table 4: Interventions provided at admission among refugees in UNHCR network hospitals, Lebanon third quarter 2021 (n=114)

Interventions provided (more than 1 per neonate)	Number	Percent
Medications:		
Parenteral antibiotics	110	96.5
IV fluids	106	93.0
Oxygen	29	25.4
Vaccines	27	23.7
Phototherapy	21	18.4
Transfusion	17	14.9
Fresh frozen plasma/plasma	19	16.7
Caffeine	10	8.8
Adrenaline	9	7.9
Dopamine	9	7.9
Lasix	7	6.1
Parenteral anticonvulsants	5	4.4
Bicarbonate	3	2.6
Albumin	2	1.8
Procedures:		
Mechanical ventilator	102	89.5
Tube through nose	90	78.9
NPO	25	21.9
Umbilical line/catheter	17	14.9
Echocardiogram	6	5.2
Operation	2	1.8
Brain CT/ultrasound	2	1.8
None	1	0.9
Undocumented	1	0.9

¹ SD = standard Deviation

Fifty-two percent (52%) of the audited cases were admitted to hospital after birth with around half (47%) being internal referrals to the NICU. Fourteen (14) cases (24% of those admitted) were hospital to hospital transfers.

The most common reasons for hospital admission after birth (table 5) were respiratory distress (34%) and prematurity (24%). The main immediate cause of death (table 6) was cardiac arrest (81%). No autopsies were performed.

Table 5: Reasons for hospital admission of neonates after birth among refugees in UNHCR network hospitals, Lebanon third quarter 2021 (n=114)

Reasons for admissions (more than 1 per neonate)	Number	Percent
RDS/HMD	39	34.2
Prematurity	27	23.7
Congenital anomaly	12	10.5
Neonatal infection/sepsis	9	7.9
DIC	4	3.5
Birth asphyxia	4	3.5
Cyanosis	4	3.5
Dyspnea	3	2.6
Hypotonic	3	2.6
Pulmonary hypertension	3	2.6
Tachypnea	2	1.8
Low birth weight	2	1.8
Underweight	2	1.8
Hemorrhage	2	1.8
Meconium aspiration	2	1.8
Dehydration	2	1.8
Renal failure	2	1.8
Jaundice	1	0.9
Fever	1	0.9
Other	8	7.0

Table 6: Immediate cause of neonatal deaths among refugees in UNHCR network hospitals, Lebanon third quarter 2021 (n=114)

Immediate cause of death	Number	Percent
Cardiac arrest	92	80.7
Cardiorespiratory arrest	10	8.8
RDS	5	4.4
Pulmonary hemorrhage	4	3.5
Respiratory arrest	3	2.6
Pulmonary hypertension	3	2.6
Sepsis/septicemia	3	2.6
Prematurity	2	2.6
Congenital anomaly/CHD	2	2.6

Septic Shock	2	2.6
Hemorrhage	1	0.9
Hemorrhagic shock	1	0.9
Cerebral hemorrhage	1	0.9
Polycystic kidney	1	0.9
Hydrops fetalis	1	0.9

With respect to the reported parental perceptions (table 7), lack of breastfeeding (85%) and breathing problems (73%) were the most common characteristics for admission to NICU as perceived by the parents or caretakers. Around a third of the parents (31%) declared that their infants were blue at birth and three quarters (73%) perceived that the infant's death was sudden. Forty-one percent (41%) of the parents felt that their infants were abnormally small. As for the non-clinical perceptions, there were 29 infants (25%) who were transported to a health facility after birth, of these 14 were transported by ambulance, 12 by private taxi and 8 faced challenges once they were at the health facility. Almost all the parents (93%) felt that the total costs of care and treatment prohibited other household payments. A third (30%) 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 third quarter 2021 (n=114).

Characteristics	Number	Percent
Clinical		
Not breastfed at all	97	85.1
Breathing problems/ventilator	83	72.8
Sudden death	83	72.8
Abnormally small	47	41.2
Blue at birth	35	30.7
Chest wall pulled	24	21.1
Unresponsive/unconscious	14	12.3
Visible malformations	14	12.3
Discharged ill	12	10.5
Stopped suckling 3 days after birth	9	7.9
Macerated	9	7.9
Vomited	8	7.0
Skin problems	8	7.0
Protruding abdomen	8	7.0
Fever	7	6.1
Born 24 hours after water broke	6	5.3
Born with umbilical cord around neck	4	3.5
Bulging or raised fontanelle	4	3.5
Convulsions	4	3.5
Born with bottom and feet first	3	2.6
Cold to touch	3	2.6
Cough	3	2.6

Diarrhea	2	1.8
Born dead	2	1.8
<hr/>		
Non-clinical		
Prohibitive costs	106	93.0
Use of phone	85	74.6
Doubts about treatment	34	29.8
Taken to the health facility	29	25.4
More than 2 hours from hospital	11	9.6
Challenges at center	8	7.0
Use of traditional medication	3	2.6

[4.1.3 Maternal Characteristics](#)

Table 8 depicts the characteristics of the refugee mothers that had neonatal deaths in UNHCR network hospitals during the third quarter of 2021 as well as certain characteristics of their delivery experience. The average age was 27 years (SD=7.3) with a minimum of 15 and a maximum of 44 years. Twenty-one percent (21%) of the women were teenagers and 18% were older than 35. On average the gravida and parity in this sample were 4.0 (SD=2.5) pregnancies and 3.4 (SD=2.2) infants respectively. The number of antenatal visits ranged from 1 to 40 visits per pregnancy with an average of 8 visits (SD= 5.9) and a median of 6 visits. Thirty-four percent of the women reported four visits or less and 18% had more than 10 visits. Of the latter 20 women, 7 were older than 35, 3 were younger than 20, 3 had twin or triplet pregnancies, 10 had delivery complications (6 of which were C-section deliveries), 4 had a breech/transverse presentation, 7 had vaginal bleeding and 5 elevated blood pressure. Sixty seven percent (67%) of the women were prescribed iron supplements and 73% given vitamins.

Most of the cases audited involved singleton births (87%), born in a network hospital (90%) and attended by a physician (86%). The average gestational age was 32 weeks (SD=5.0). Seventy-five percent (75%) of the infants were premature with 20% born before the 28th week of pregnancy. Forty-five percent (45%) of the deliveries were Cesarean sections. There was one case of unassisted spontaneous delivery and three cases of assisted vaginal deliveries. Fifty-two percent (52%) of the women reported danger signs with abdominal pain (24 cases) and vaginal bleeding (27 cases) reported 41% and 46% of the time. Forty percent (40%) of the women reported adverse labor events with preterm rupture of the membrane (n=34) reported 76% of the time. Forty-

two percent (42%) of the women had delivery complications, with unplanned/emergency C-section (n=29) reported around two thirds of the time (60%). All the women are alive.

Table 8: Maternal and Delivery Characteristics of neonatal deaths among refugees in UNHCR network hospitals, Lebanon third quarter 2021 (n=114)

Characteristics	Mean ± SD	Min-Max
Age	27.4±7.3	15-44
Gravida	4.0±2.5	1-14
Parity	3.4±2.2	1-12
Antenatal visits	7.7±5.9	1-40
Gestational age	32.3±5.0	22-40
Maternal age (years)	Number	Percent
<20	24	21.1
20-35	70	61.4
>35	20	17.5
Number of visits		
2	7	6.1
3	15	13.2
4	17	14.9
5	12	10.5
6	7	6.1
7	8	7.0
8	14	12.3
9	5	4.4
10	9	7.9
11+	20	17.5
Gestational age		
Extremely preterm (< 28 weeks)	23	20.2
Very preterm (28 - 31 weeks)	21	18.4
Moderate preterm (32 - 36 weeks)	41	36.0
Full Term (37 - 42 weeks)	29	25.4
Type of pregnancy		
Single	99	86.8
Twin	14	12.3
Triplets	1	0.9
Place of birth		
Network Hospital	103	90.4
Referral Hospital	6	5.3
Clinic	3	2.6
At home	1	0.9
On the way	1	0.9
Mode of delivery		
Spontaneous Vaginal Delivery (skilled attendant)	57	50.0
Cesarean Section	51	44.7
Assisted Vaginal Delivery	3	2.6
Spontaneous Vaginal Delivery (unattended)	1	0.9
Fetal Presentation		
Cephalic	53	46.5
Transverse	5	4.4
Breech	8	7.0

Don't Know	48	42.1
Pregnancy Danger Signs		
Yes	59	51.8
No	55	48.2
Anemia		
Yes	27	23.7
No	87	76.3
Adverse labor events		
Yes	45	39.5
No	69	60.5
Delivery complications		
Yes	48	42.1
No	66	57.9

4.1.4 Risk Factors

The most common medical risk factor was prematurity (75%). Thirty percent (30%) of the women had premature rupture of the membranes and 25% had a C-section as a delivery complication. Twenty-four percent (24%) of the women complained of vaginal bleeding during pregnancy.

Table 9: Maternal Risk factors for neonatal deaths among refugees in UNHCR network hospitals, Lebanon third quarter 2021 (n=114)

Contributing Risk Factors	Number	Percent
Antenatal complications		
Vaginal bleeding	27	23.7
Abdominal pain	24	21.1
Elevated blood pressure	7	6.1
Glycosuria	2	1.8
Labor/Delivery related		
Premature rupture of membranes	34	29.8
C-section delivery (complication)	29	25.4
Prolonged obstructed labor	7	6.1
Postpartum hemorrhage	4	3.5
Prolonged ROM	2	1.8
Eclampsia/pre-eclampsia	2	1.8
Cord prolapse	1	0.9
Neonate related		
Prematurity	85	74.6

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 (93%) 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, 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 mostly 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 (7) expressed some concerns about the treatment that they were receiving in the health facilities (before, during and after delivery) and the lack of communication with the healthcare personnel. Some parents blamed the medical personnel for the fate of their infant and complained about the poor treatment that the mother received. In addition, there were several instances (16) where the parents did not know appear to know what happened to their child and what were the causes of death.

The qualitative accounts also point to the need for proper counseling for the caregiver post-delivery on danger signs, need for postnatal visits, harmful practices, breastfeeding, vaccination, Cord care, thermal care, and hygiene, 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. 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 third quarter of 2021, a total of 114 neonatal audits were completed over the 3 months. There was a slight decrease in the number of hospital-reported neonatal deaths relative to the second quarter (114 vs. 122) which is contrary to what was observed in the third quarter of last year (2020) where the largest numbers of deaths were reported (137). This could be in part explained by the economic situation and the fuel shortage which prevented people from seeking care in hospitals. 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 trends in neonatal mortality among refugees in the country.

Similar to last quarter, 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 the last two quarters. One possible explanation could be that there are several hospitals in the Bekaa, including the one with the most reported cases in previous quarters, that are no longer part of the UNHCR network. In comparison to Q3 2020 (3 hospitals reporting this quarter vs. 8 hospitals in Q3 2020). It is eminent to mention that after June 2021, three hospitals having NICU wards were removed from the UNHCR hospital network in Bekaa and one hospital added with NICU beds; hence in Bekaa, 6 instead of 8 hospitals with NICU wards were contracted with UNHCR with NICU wards. Moreover, the hospitals in the South are receiving admissions from refugees residing in Beirut Mount Lebanon and 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.

The neonatal mortality rates for this quarter are considerably lower than those for quarter two 2021 in all the governorates. The current quarter rates for the South, North, Bekaa and BML were respectively 13.54, 11.20, 10.28 and 8.85. These rates per region are less than those observed during the first quarter of 2021 (13.59, 12.69, 11.15 and 11.78) and less than the rates observed during the third quarter of 2020. In fact, with the exception of the neonatal mortality rates in the South, all rates this quarter

are less than the SDG recommended target of 12 deaths per 1000 births. Note that, 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. Comparing Q3 2021 to Q2 & Q1, the number of live births across the regions have increased by more than 2,000 births between the quarters; however, the crude number of neonatal mortalities has decreased explaining the decrease in the NNMR across the regions.

In general, the maternal and infant characteristics of the sample appear to be similar to those reported in the previous quarter. However, there appears to be an increase in premature deliveries and the proportion of teenage and older mothers relative to previous quarters. This indicates the need for more awareness on early marriage and proper family planning for the refugee population. In addition, the median number of antenatal visits (6) is lower than last quarter (8 visits), with 34% of the women reporting four visits or less this quarter compared to 22% last quarter which can be indicated to the economic situation limiting access of refugees to medical care related to ANC whether for direct financial reasons or priority of other basic needs.

With regards to the delivery-related characteristics, although the proportion of C-section deliveries is lower compared to last quarter (57%), the proportion of C-sections reported as delivery complications is higher (25% vs. 20%). Delivery complications in general, seem to be higher than last quarter (42 vs. 32%) and closer to the proportion reported for the first quarter (48%).

The more prominent risk factors remain the same namely prematurity, C-section as a delivery complication and premature rupture of the membrane as an adverse labor event. However, there seems to be a higher prevalence for most risk factors this quarter. One possible explanation could be the economic condition in the country which engendered delays in accessing prenatal and delivery care and paying for care as well as challenges with finding the needed medications.

5.1 Limitations

Similar to previous quarters, 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 who have completed 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. Still births will be incorporated in the next quarter as a pilot. UNHCR in collaboration with USJ will target audits for stillbirth mortalities to ensure capture of all mortalities among 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, birth spacing, etc. UNHCR in collaboration with USJ are modifying the survey form to include the different variables to be captured allowing for better analysis of the data.

5.2 Challenges

The team is still facing challenges pertaining to 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. The access to the hospitals improved towards the end of the quarter and the field investigators were able to access all medical records. Infant information remains mostly undocumented if the infant was born in a different hospital. There were more alerts of ineligible infants due to age restrictions. Moreover, the field investigators are still conducting the interviews over the phone although it is more because of the petrol and financial issues than because

of the Covid-19 pandemic this quarter. In addition, there have been problems with electricity shortage and internet connections.

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. UNHCR in collaboration with USJ are modifying the survey form to include the different variables to be captured allowing for better analysis of the data.

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. Provide training for interviewers on standardized definitions and the type and volume of qualitative information required
2. Train health personnel on the necessity of having complete information pertaining to the birth of the neonate including birth weight and Apgar scores.
3. Standardize physician's reporting of immediate and underlying causes of death.
4. 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. 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.
5. Provide trainings to health personnel on importance of awareness post-delivery on danger signs, need for postnatal visits, harmful practices, breastfeeding, vaccination, Cord care, thermal care, and hygiene,
6. Develop NICU monitoring tools, reflecting the risks mentioned.