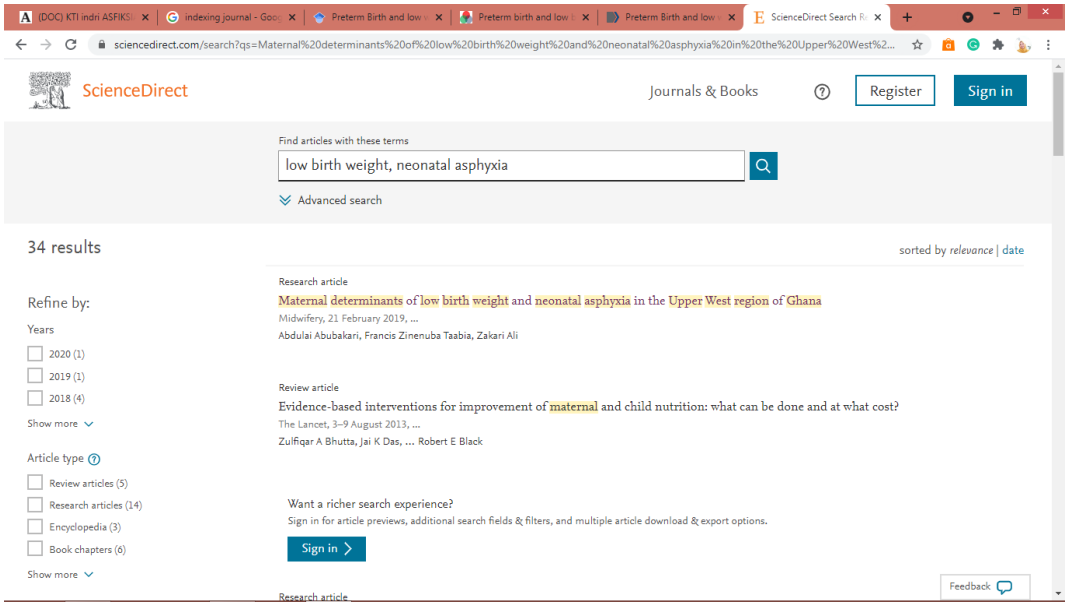
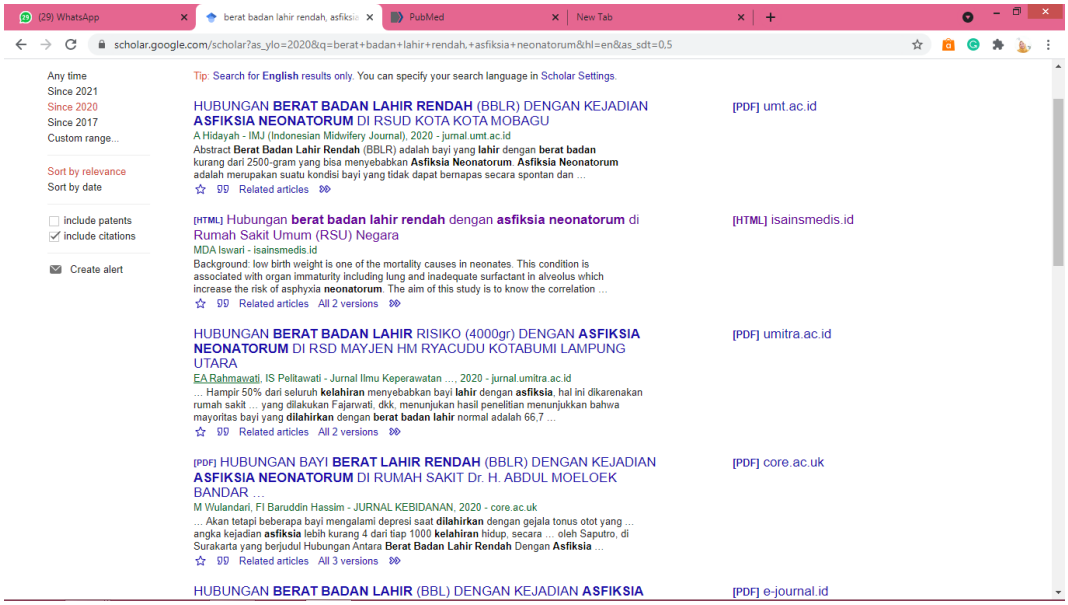
LAMPIRAN

Lampiran 1. Pencarian Literatur dengan Database Sciencedirect



Lampiran 2. Pencarian Literatur dengan Database Google Schoolar



Lampiran 3. Lembar Konsultasi Online

KEMENTRIAN KESEHATAN RI

POLITEKNIK KESEHATAN KEMENKES SURABAYA

PROGRAM STUDI DIII KEPERAWATAN SIDOARJO

LEMBAR BIMBINGAN KONSULTASI KARYA TULIS ILMIAH KTI

2020/2021

NAMA MAHASISWA : Fifi Nilla Permata Sari

NIM : P27820418016

JUDUL : Literature Review Hubungan Berat Bayi Lahir Rendah Dengan Asfiksia Neonatorum.

NO.	HARI TANGGAL	MATERI BIMBINGAN	REVISI	TTD MAHASISWA	TTD DOSEN
1.	Sabtu, 02 februari 2021	1.Arahan penyusunan Karya Tulis Ilmiah KTI. 2.Kontrak prosedur bimbingan	-		
2.	Sabtu, 13 Februari 2021	BAB 1	1. Judul Pakai studi literatur/ literatur review. 2.memperbaiki tujuan umum dan tujuan khusus		

3.	Jumat, 26 Februari 2021	BAB 2	Melengkapi materi		
4.	Kamis, 11 Maret 2021	BAB 3	1. Kata kunci 2.Diagram Flow diperbaiki. 3.Urutan penulisan nomor Tabel. 4.Metode jurnal dilengkapi.		
5.	Senin, 22 Maret 2021	Evaluasi Keseluruhan Karya Tulis Ilmiah.	1. Daftar Pustaka Disertakan alamat jurnal.		
6.	Senin, 29 Maret 2021	Arahan Persiapan Seminar Karya Tulis Ilmiah.	-		
7.	Jum’at, 30 Maret 2021	1. Arahan penyusunan KTI. 2. Kontrak prosedur bimbingan.	-		

8.	Senin, 03 Mei 2021	BAB 4 Hasil Dan Analisis	Memperbaiki isi dari bab 4		
9.	Rabu, 05 Mei 2021	BAB 4 Hasil Dan Analisis	Merapikan setiap sub bab.		
10.	Senin, 17 Mei 2021	BAB 5 Pembahasan	1.Memperbaiki isi pembahasan setiap topik. 2. Lebih dijabarkan lagi		
11.	Kamis, 20 Mei 2021	BAB 5 Pembahasan	1.Menambahkan teori yang dibahas dan opini sendiri. 2.Merapikan sub bab		
12.	Senin, 24 Mei 2021	BAB 6 Penutup dan Abstrak	1.Memperbaiki kesimpulan. 2. Saran sesuai manfaat. 3. Pada abtrak memperbaiki analisis, hasil, kesimpulan		

Lampiran 4. Lembar Perbaikan Seminar Proposal KTI

Form.11.01.54

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Catatan Perbaikan Seminar Proposal KTI
Prodi D3 Keperawatan Sidoarjo
Tahun Akademik : 2020/2021

NAMA MAHASISWA : Fifi Nilla Permata Sari
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JUDUL KTI : Literature Review Hubungan Berat Bayi Lahir Rendah Dengan Asfiksia Neonatorum.

No	Revisi	Tanda Tangan Penguji
1.	Loetfia Dwi Rahariyani, S.Kp., M.Si Saran : 1) Memperbaiki Cover dan Nama Pembimbing 2) Merapikan Daftar Isi dan sub bab 3) Memperbaiki Nomer Halaman 4) Memperbaiki Rumusan Masalah 5) Kriteria Inklusi dan Ekslusi lebih Detail, disertakan Indikator.	
2.	Kusmini S,S.Kp,M.Kep,Sp.Kep.An Saran : 1) Memperbaiki Penulisan 2) Hasil Pencarian Literature dibuat Landscape 3) Penulisan Karya Tulis Ilmiah diganti Proposal 4) Menambahkan Kutipan disetiap Paragraf	

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Dr. Yessy Dessy Arna, M.Kep., Sp.Kom
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Lampiran 5. Lembar Perbaikan Seminar Hasil KTI

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Politeknik Kesehatan Kemenkes Surabaya
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Tahun Akademik : 2020/2021

NAMA MAHASISWA : Fifi Nilla Permata Sari
NIM : P27820418016
JUDUL KTI : Literature Review Hubungan Berat Bayi Lahir Rendah Dengan Asfiksia Neonatorum.

No	Revisi	Tanda Tangan Penguji
1.	Loetfia Dwi Rahariyani, S.Kp., M.Si Saran : 1) Memperbaiki Cover 2) Memperbaiki Abstrak 3) Memperbaiki Tabel Hasil Pencarian Literature Tidak Boleh Landscape, diganti ke potrait 4) Karakteristik studi paragraf kedua tidak usah dicantumkan 5) Pada hasil analisis kejadian BBLR bisa dicantumkan data berat badan, usia kehamilan, jenis kelamin dan dibuat diagram 6) Pada tabel analisis hubungan BBLR dengan asfiksia disertakan nilai p-value nya 7) Memperbaiki pembahasan dan lebih fokus 8) Memperbaiki kesimpulan	

2.	Kusmini S,S.Kp,M.Kep,Sp.Kep.An Saran : 1) Kurang lebih sama seperti bu lutfi 2) Memperbaiki abstrak 3) Pembahasan ditambahkan	

Mengetahui
Pembimbing Utama KTI

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Lampiran 6. Jurnal 1

ORIGINAL ARTICLE

Intisari Sains Medis 2018, Volume 9, Number 2: 95-99
P-ISSN: 2503-3638, E-ISSN: 2089-9084

Hubungan antara bayi berat lahir rendah dengan asfiksia neonatarum di RSUD Wangaya Kota Denpasar

Ida Bagus Wiadnyana, I Wayan Bikin Suryawan, A.A Made Sucipta

ABSTRACT

Background: Low Birth Weight (LBW) in infants is still a problem in the health sector, especially perinatal health. The prevalence of low birth weight babies (BBLR) is estimated to be 15% of all births in the world with a 3.3% -38% limit and is more common in developing countries or low socio-economic countries. Frequent complications of LBW such as hypothermia, respiratory disorders, gastrointestinal disorders, immunological disorders, liver immaturity, renal immunity and bleeding. In LBW, there can be a lack of surfactant and not yet perfect growth and lung development so that difficulties start breathing which result to occur Neonatal Asphyxia. The purpose of this study was to determine the relationship of degree of LBW with the degree of Neonatal Asphyxia.
Methods: The type of research used is observational analytic with *cross sectional* study design. In this study, sampling was performed at LBW at Wangaya Hospital April 2016 - April 2017 period in NICU and Perinatology room until the number of research samples fulfilling the inclusion and exclusion criteria with total sample of 87 samples. The sample is obtained by *consecutive sampling* method, then collecting the necessary data. The data obtained were analyzed analytically, then presented in tabulation data and described using tables and narration.
Result: There was a significant correlation between degree of BBLR and degree of Asphyxia Neonatarum (p = 0,03), BBLR was risk factor to degree of asphyxia with prevalence prevalence (RP) = 2.08 (95% CI = 1.08 - 1, 30).
Conclusion: There was a significant correlation between degree of LBW and degree of Neonatal Asphyxia.

Keywords: Low Birth Weight (LBW), Neonatal Asphyxia
Cite This Article: Wiadnyana, I.B., Suryawan, I.W.B., Sucipta, A.A.M. 2018. Hubungan antara bayi berat lahir rendah dengan asfiksia neonatarum di RSUD Wangaya Kota Denpasar. *Intisari Sains Medis* 9(2): 95-99. DOI: 10.1556/ism.v9i2.167

ABSTRAK

Latar Belakang: Bayi Berat Lahir Rendah (BBLR) pada bayi masih merupakan masalah di bidang kesehatan terutama kesehatan perinatal. Prevalensi bayi dengan berat badan lahir rendah (BBLR) diperkirakan 15% dari seluruh kelahiran di dunia dengan batasan 3,3%-38% dan lebih sering terjadi di negara berkembang atau negara dengan sosio-ekonomi rendah. Komplikasi yang sering terjadi pada BBLR seperti hipotermi, gangguan pernafasan, gangguan alat pencernaan, gangguan immunologi, immatur hati, immatur ginjal serta perdarahan. Pada BBLR dapat terjadi kekurangan surfaktan dan belum sempurna pertumbuhan dan perkembangan paru sehingga kesulitan memulai pernafasan yang berakibat untuk terjadi asfiksia neonatorum. Tujuan dari penelitian ini adalah untuk mengetahui hubungan derajat BBLR dengan derajat asfiksia neonatorum.
Metode: Jenis penelitian yang digunakan adalah observasional analitik dengan rancangan penelitian *cross sectional*. Pada penelitian ini, pengambilan sampel dilakukan pada BBLR di RSUD Wangaya periode April 2016 - April 2017 di ruang Nicu dan Perinatologi sampai jumlah sampel penelitian yang memenuhi kriteria inklusi dan eksklusi dengan jumlah sample total 87 sampel. Sampel diperoleh melalui metode *consecutive sampling*, selanjutnya dilakukan pengumpulan data yang diperlukan. Data yang diperoleh dianalisis secara analitik, selanjutnya disajikan dalam tabulasi data serta dijabarkan menggunakan tabel dan narasi.
Hasil: Terdapat hubungan yang signifikan antara derajat BBLR dengan derajat Asfiksia Neonatarum (p=0,03), BBLR merupakan factor resiko terhadap derajat asfiksia dengan nilai resiko prevalensi (RP)=2,08 (IK 95%=1,08 – 1,30).
Simpulan: Terdapat hubungan yang signifikan antara derajat BBLR dengan derajat Asfiksia Neonatarum.

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Received: 2018-02-05
Accepted: 2018-02-21
Published: 2018-05-1

Kata kunci: BBLR, Asfiksia Neonatarum.
Cite Pasal Ini: Wiadnyana, I.B., Suryawan, I.W.B., Sucipta, A.A.M. 2018. Hubungan antara bayi berat lahir rendah dengan asfiksia neonatarum di RSUD Wangaya Kota Denpasar. *Intisari Sains Medis* 9(2): 95-99. DOI: 10.1556/ism.v9i2.167

PENDAHULUAN

Asfiksia adalah suatu keadaan bayi baru lahir yang gagal bernafas secara spontan dan teratur segera setelah lahir. Asfiksia merupakan salah satu penyebab mortalitas dan morbiditas bayi baru lahir dan

akan membawa beberapa dampak pada periode neonatal baik di negara berkembang maupun negara maju.[1]

Menurut laporan World Health Organization (WHO) pada tahun 2000 Angka Kematian Bayi (AKB) didunia 54 per 1000 kelahiran hidup dan tahun 2006 menjadi 49 per 1000 kelahiran hidup. Setiap tahunnya sekitar 3% (3,6 juta) dari 120 juta bayi lahir mengalami asfiksia, hampir 1 juta bayi ini kemungkinan meninggal.[1]

Berdasarkan hasil survei Demografi dan Kesehatan Indonesia (SDKI) tahun 2012, Angka Kematian Neonatus (neonatal mortality rate, NMR) pada tahun 2012 sebesar 19 per 1000 kelahiran hidup menurun dari 20 per 1000 kelahiran hidup di tahun 2007 dan 23 per 1000 kelahiran hidup berdasarkan hasil SDKI 2002.[2] Perhatian terhadap upaya penurunan neonatal mortality rate (usia dibawah 28 hari) menjadi penting karena kematian neonatal memberi kontribusi terhadap 56% kematian bayi.[3]

Masalah utama penyebab kematian pada bayi dan balita adalah pada masa neonatus (bayi baru lahir umur 0- 28 hari). Menurut hasil Riskesdas 2007 menunjukkan bahwa 78,5% dari kematian neonatal terjadi pada umur 0 - 6 hari.[4]

Komplikasi yang menjadi penyebab kematian terbanyak adalah asfiksia, bayi berat lahir rendah dan infeksi.[4]

Berat Badan Lahir Rendah (BBLR) pada bayi masih merupakan masalah di bidang kesehatan terutama kesehatan perinatal. Prevalensi bayi dengan berat badan lahir rendah (BBLR) diperkirakan 15% dari seluruh kelahiran di dunia dengan batasan 3,3%-38% dan lebih sering terjadi di negara berkembang atau negara dengan sosio-ekonomi rendah.[5] Di Indonesia prevalensi BBLR berkurang dari 11,1% pada tahun 2010 menjadi 10,2% pada tahun 2013.[6]

Prevalensi kejadian BBLR di provinsi Bali yaitu 12,1% pada hasil data Riskesdas tahun 2010, di kota Denpasar jumlah BBLR sebanyak 181 dari 18.386 jumlah kelahiran hidup.[7] Selain prevalensinya tinggi, bayi dengan berat badan lahir rendah juga merupakan salah satu faktor yang mempunyai kontribusi terhadap kematian bayi khususnya pada masa perinatal. Komplikasi yang sering terjadi pada BBLR seperti hipotermi, gangguan pernafasan, gangguan alat pencernaan, gangguan immunologi, immatur hati, immatur ginjal serta perdarahan, selain itu bayi dengan BBLR dapat mengalami gangguan mental dan fisik pada usia tumbuh kembang selanjutnya.[8]

Pada BBLR dapat terjadi kekurangan surfaktan dan belum sempurna pertumbuhan dan perkembangan paru sehingga kesulitan memulai pernafasan yang berakibat untuk terjadi asfiksia neonatorum. Hal inilah yang membuat peneliti ingin mengetahui hubungan antara BBLR dengan tingkat keparahan asfiksia neonatorum.[9]

METODE

Penelitian ini merupakan penelitian analitik observasional dengan desain *cross-sectiona* untuk mencari hubungan antar variabel, yaitu variabel bebas (faktor resiko) dan variabel tergantung (efek). Penelitian ini dilakukan di di Ruang Nicu dan Perinatologi anak RSUD Wangaya kota Denpasar. Besar sampel mínimum pada penelitian ini adalah 87 sampel. 87 sampel dipilih menggunakan Teknik konsekutif, yaitu semua Bayi yang mengalami BBLR, dirawat inap di ruang Nicu dan Perinatologi RSUD Wangaya Kota Denpasar periode April 2016 - April 2017 yang memenuhi kriteria inklusi dan eksklusi. Sampel dipilih dengan mempertimbangkan kriteria inklusi berupa BBLR di RSUD Wangaya periode April 2016 - April 2017. Sedangkan kriteria ekslusi adalah Rekam medis tidak lengkap.

Sumber data dalam penelitian ini adalah berupa data sekunder yang berasal dari rakam medis pasien. Persetujuan penelitian dan penggunaan rekam medis telah disetujui oleh Kepala bagian SMF Anak di RSUD Wangaya Denpasar.

Data kemudian diolah, disajikan dalam bentuk tabel serta dilakukan analisis hasil. Dilakukan analisis Univariat untuk mendeskripsikan karakteristik responden dalam penelitian. Analisis Hubungan BBLR dengan kejadian asfiksia di ruang Nicu RSUD Wangaya Denpasar diuji dengan menggunakan uji statistik Chi Square. Analisis hubungan derajat BBLR dengan tingkat keparahan asfiksia neonatorum di RSUD Wangaya dengan menggunakan analisis Rank Spearman. Data diolah dengan Statistical Product and Service Solution (SPSS) 20 for Windows.

HASIL

Pada penelitian ini, pengambilan sampel dilakukan pada BBLR di RSUD Wangaya periode April 2016 - April 2017 di ruang Nicu dan Perinatologi sampai jumlah sampel penelitian yang memenuhi kriteria inklusi dan eksklusi dengan jumlah sample total 87 sample. Berikut disajikan tabel deskripsi sampel berdasarkan karakteristik jenis kelamin, proses persalinan derajat BBLR, dan derajat Asfiksia neonatarum.

Persebaran sampel berdasarkan jenis kelamin menunjukkan persebaran yang cukup merata antara anak perempuan dan laki-laki dengan persentase 50,5% dan 49,5%. Proses persalinan terbanyak adalah section cesar yaitu 54,1% dibandingkan persalinan normal yaitu 45,9%. Derajat BBLR pada Penelitian ini yang terbanyak adalah

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Tabel 1 Karakteristik Sampel Penelitian

Variabel Penelitian	Frekuensi	%
Jenis Kelamin		
Laki-laki	43	49,5
Perempuan	44	50,5
Proses Persalinan		
Normal	40	45,9
Sectio cesar	47	54,1
Derajat BBLR		
BBLR	58	66,7
BBLSR	29	33,3
Derajat Asfiksia		
Sedang	53	60,8
Berat	34	39,2
Total	87	100,00

Tabel 2 Pengaruh BBLR terhadap Asfiksia

Berat Badan lahir	Asfiksia Sedang	Asfiksia Berat	Total	P
BBLR	41 (70,7%)	17 (29,3%)	58 (100%)	0,03*
BBLSR	10 (34,5%)	19 (65,5%)	29 (100%)	
Total	51 (58,6%)	36 (41,4%)	87 (100%)	

CI 95%: 1,08 – 1,30
* uji ***chi square***

pada berat badan 1500 – 2500-gram sekitar 66,7%. Derajat Asfiksia pada Penelitian ini yang terbanyak adalah Asfiksia sedang sekitar 60,8% dibandingkan Asfiksia berat sekitar 39,2% (Tabel 1).

Dari hasil penelitian ini didapatkan jumlah sampel bayi dengan BBLR adalah 58 sampel (66,7%) dan jumlah bayi dengan BBLSR adalah 29 sampel (33,3%). Jumlah bayi BBLR dengan Asfiksia sedang adalah jumlah terbanyak yaitu 41 (70,7%). Tabel 2 memperlihatkan hasil uji hipotesis dengan menggunakan uji *chi square,* dimana nilai p sebesar 0,03. Karena nilai p< 0,05, maka dapat disimpulkan bahwa terdapat hubungan yang signifikan antara BBLR dengan derajat Asfiksia Neonatarum.

Hubungan antara BBLR dengan tingkat keparahan Asfiksia di sajikan dalam hubungan yang disebut dengan Risiko Prevalensi (RP) dengan rumus:

$$RP = \frac{A/(A+B)}{C/(C+D)} = \frac{41/58}{10/29} = 2{,}08$$

Keterangan:

A/(A+B): Prevalensi subjek dengan faktor risiko positif yang terkena penyakit.
C/(C+D): Prevalensi subjek tanpa faktor risiko yang terkena penyakit.

Interprestasi Hasil:

RP < 1: Bayi berat lahir sangat rendah merupakan factor protektif terhadap Derajat asfiksia
RP = 1: Bayi berat lahir sangat rendah merupakan factor atau tidak berpengaruh terhadap derajat asfiksia
RP >1: Bayi berat lahir sangat rendah benar-benar merupakan factor resiko atau berpengaruh terhadap derajat asfiksia

Dari hasil perhitungan didapatkan resiko prevalensi sebesar 2,08 dimana dapat diinterprestasikan bahwa BBLR benar-benar merupakan factor resiko atau berpengaruh terhadap derajat asfiksia. Interval kepercayaan 95% sebesar 1,08 – 1,30 dimana tidak mencakup angka 1, yang berarti dalam populasi hal tersebut diatas benar terjadi.

DISKUSI

Karakteristik sampel pada Penelitian ini antara lain, jenis kelamin, proses persalinan, derajat BBLR, derajat Asfiksia. Keseluruhan sampel berjumlah 87 sampel bayi.

Persebaran sampel berdasarkan jenis kelamin menunjukkan persebaran yang cukup merata antara anak perempuan dan laki-laki dengan persentase 50,5% dan 49,5%. Hasil penelitian ini sejalan dengan penelitian sebelumnya tahun 2012 di RSUD Kabupaten Karanganyar yaitu persentase jenis kelamin perempuan dan laki-laki 49,6% dan 50,4%,[10] sedangkan dari beberapa penelitian ditemukan bahwa jenis kelamin bayi berpengaruh terhadap kejadian BBLR, seperti di Srilanka perbedaan berat badan bayi sebesar 58 gr antara bayi laki – laki dan perempuan dimana berat badan bayi laki – laki lebih berat di bandingkan dengan bayi perempuan.[11]

Proses persalinan terbanyak adalah section cesar yaitu 54,1% dibandingkan persalinan normal yaitu 45,9%. Hasil serupa juga didapatkan oleh Zanardo, peneliti mendapatkan risiko 2,6 kali untuk mengalami risiko kelainan pernapasan pada bayi yang dilahirkan melalui section caesarea jika dibandingkan melalui persalinan per vaginam. Peneliti menggunkan 1284 responden dengan operasi sectio caesarea elektif tanpa komplikasi yang diikuti 3 tahun sebelum melahirkan. Resiko ini meningkat jika analisis gangguan pernapasan dipisah berdasarkan jenis kelainannya. Resiko untuk terjadi respiratory distress syndrome meningkat menjadi 5,6 kali dan transient takipneu of newborn menjadi 2,8 kali.[12] Melahirkan dengan

alat, meconium pada cairan amnion, dan pecah ketuban yang berkepanjangan adalah faktor risiko asfiksia perinatal pada bayi baru lahir.[13]

Derajat BBLR pada Penelitian ini yang terbanyak adalah pada berat badan 1500 – 2500-gram sekitar 66,7%. Hasil penelitian ini sejalan dengan penelitian sebelumnya tahun 2012 di RSUD Kabupaten Karanganyar yaitu persentase berat badan lahir terbanyak adalah 1500 – 2500-gram sekitar 85,6%.[10] Bayi BBLR beresiko mengalami serangan apneu dan defesiensi surfaktan, sehingga tidak dapat memperoleh oksigen yang cukup yang sebelumnya diperoleh dari plasenta.[14] Gangguan pernafasan sering menimbulkan penyakit berat pada Bayi Berat Lahir Rendah (BBLR). Hal ini disebabkan oleh kekurangan surfaktan, pertumbuhan dan pengembangan paru yang masih belum sempurna. Otot pernafasan yang masih lemah dan tulang iga yang mudah melengkung, sehingga sering terjadi apneu, asfiksia berat dan sindroma gangguan pernafasan.[15]

Penelitian ini dilakukan untuk mencari hubungan antara BBLR dengan derajat Asfiksia Neonatarum. Dari hasil penelitian ini didapatkan nilai p sebesar 0,03. Karena nilai $p < 0,05$, maka dapat disimpulkan bahwa terdapat pengaruh yang signifikan antara BBLR dengan Derajat asfiksia. Dari hasil perhitungan didapatkan resiko prevalensi sebesar 2,08 dimana dapat diinterprestasikan bahwa BBLR benar-benar merupakan factor resiko atau berpengaruh terhadap derajat asfiksia. Interval kepercayaan 95% sebesar 1,08 – 1,30 dimana tidak mencakup angka 1, yang berarti dalam populasi hal tersebut diatas benar terjadi. Hasil penelitian ini sejalan dengan penelitian sebelumnya tahun 2012 di RSUD Kabupaten Karanganyar yang menunjukkan adanya pengaruh signifikan antara BBLR dengan derajat Asfiksia (p= 0,00).[10] Bayi dengan BBLR memiliki organ-organ yang kurang sempurna kematangannya, termasuk organ paru, sehingga dapat terjadi kekurangan surfaktan yang mengarah ke penyakit membran hialin (PMH). Bayi dengan BBLR mengalami pertumbuhan dan perkembangan paru kurang sempurna, reflek batuk, reflek menghisap dan reflek menelan yang kurang terkoordinasi, dan otot- otot bantu pernafasan yang lemah. Hal ini menyebabkan kesulitan bernafas dan berakibat terjadi asfiksia.[16]

KETERBATASAN

Data dalam penelitian ini masih menggunakan data sekunder dan pada penelitian ini variabel independen yang diteliti hanya terbatas pada BBLR, sehingga beberapa faktor risiko lain dalam pustaka yang kemungkinan berhubungan dengan variabel dependen tidak dianalisis. Faktor risiko yang menyebabkan terjadinya asfiksia sangatlah bervariasi. Subyek dalam penelitian kurang variatif karena hanya mengambil dari satu rumah sakit sehingga tidak bisa digeneralisasikan serta waktu dalam pengumpulan sampel yang cukup singkat.

SIMPULAN

Pasien BBLR di ruang NICU dan Perinatologi di RSUD Wangaya persebaran jenis kelamin laki-laki dan perempuan cukup merata. Didapatkan persalinan dengan SC menunjukkan persentase yang lebih tinggi dibandingkan persalinan normal yaitu 54,1%. Terdapat pengaruh yang signifikan antara BBLR terhadap derajat Asfiksia di RSUD Wangaya Kota Denpasar.

Diharapkan dapat dilakukan penelitian lebih lanjut mengenai faktor-faktor yang mempengaruhi terjadinya asfiksia selain BBLR sehingga diketahui faktor yang paling berpengaruh. Diharapkan dapat dilakukan penelitian menggunakan metode yang lebih kuat dengan jumlah sampel yang lebih besar serta waktu penelitian yang lebih panjang, sehingga diperoleh hasil yang lebih mewakili dan dapat direpresentasikan dengan lebih baik pada populasi.

DAFTAR PUSTAKA

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Lampiran 7. Jurnal 2

CASE REPORT
Intisari Sains Medis 2020, Volume 11, Number 3: 1510-1514
P-ISSN: 2503-3638, E-ISSN: 2089-9084
Published by DiscoverSys

Hubungan berat badan lahir rendah dengan asfiksia neonatorum di Rumah Sakit Umum (RSU) Negara

Made Dwitia Ayu Iswari[1*]

ABSTRACT

Background: low birth weight is one of the mortality causes in neonates. This condition is associated with organ immaturity including lung and inadequate surfactant in alveolus which increase the risk of asphyxia neonatorum.The aim of this study is to know the correlation between low birth weight and asphyxia neonatorum in RSU Negara.
Methods: The design of this study was observational analytic cross-sectional. Neonates, who were hospitalized in NICU and perinatology RSU Negara, Jembrana in August 2019-August 2020 were assigned by systematic random sampling. Data was collected from medical records. Then, data was analyzed using chi-square test and logistic regression test to get prevalence ratio (PR). The value of $p<0.05$ was considered significant.
Result: As many as 150 neonates were recruited in the study. A multivariate analysis showed the prevalence of asphyxia neonatorum was significantly higher in low birth weight neonates (PR=2.331, p=0.045; IK 95% 1.018-5.338) than non-low birth weight neonates. There were no association between asphyxia neonatorum and prematurity, mode of delivery and sex of newborn.
Conclusion: low birth weight is associated with asphyxia neonatorum.

Keywords: low birth weight, asphyxia neonatorum.
Cite This Article: Iswari, M.D.A. 2020. Hubungan berat badan lahir rendah dengan asfiksia neonatorum di Rumah Sakit Umum (RSU) Negara. *Intisari Sains Medis* 11(3): 1510-1514. DOI: 10.15562/ism.v11i3.871

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ABSTRAK

Latar Belakang: Berat badan lahir rendah merupakan salah satu penyebab kematian neonatus. Kondisi ini disertai dengan imaturitas organ tubuh termasuk paru-paru dan kurangnya surfaktan dalam alveolus sehingga meningkatkan risiko terjadinya asfiksia neonatorum. Tujuan penelitian ini adalah untuk mengetahui hubungan antara berat badan lahir rendah dan asfiksia neonatorum di RSU Negara.
Metode: penelitian ini menggunakan rancangan analitik observasional potong-lintang. Neonatus yang dirawat di Bagian NICU dan perinatologi RSU Negara, Jembrana dalam kurun waktu Agustus 2019 – Agustus 2020 yang dikumpulkan secara *systematic random sampling*. Data dikumpulkan dari rekam medis. Data kemudian dianalisis secara bivariat dengan uji *chi-square* dan multivariat dengan uji regresi logistik sehingga diperoleh *prevalence ratio* (PR). Hubungan dikatakan signifikan apabila diperoleh nilai p< 0,05.
Hasil: penelitian ini mengikutsertakan sebanyak 150 neonatus. Berdasarkan hasil uji multivariat, prevalensi kejadian asfiksia neonatorum lebih tinggi pada neonatus dengan BBLR (PR=2,331, p=0,045; IK 95% 1,018-5,338) dibandingkan dengan yang tidak mengalami BBLR. Tidak ada perbedaan kejadian asfiksia berdasarkan prematuritas, cara persalinan, dan jenis kelamin bayi.
Simpulan: berat badan lahir rendah berhubungan dengan asfiksia neonatorum

Kata kunci: berat badan lahir rendah, asfiksia neonatorum.
Sitasi Artikel ini: Iswari, M.D.A. 2020. Hubungan berat badan lahir rendah dengan asfiksia neonatorum di Rumah Sakit Umum (RSU) Negara. *Intisari Sains Medis* 11(3): 1510-1514. DOI: 10.15562/ism.v11i3.871

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Diterima: 30-09-2020
Disetujui: 06-11-2020
Diterbitkan: 01-12-2020

PENDAHULUAN

Asfiksia neonatorum adalah kondisi berkurangnya aliran darah atau pertukaran gas baik yang berasal dari maupun yang menuju sirkulasi janin pada periode sesaat sebelum, selama, atau setelah proses melahirkan. Insiden asfiksia neonatorum di negara maju sekitar 2 dari setiap 1.000 kelahiran, namun pada negara berkembang, angka insiden tersebut dapat mencapai 10 kali lipat lebih tinggi. Sebesar 15-20% dari total neonatus dengan asfiksia diketahui mengalami mortalitas pada periode neonatal, dan sebanyak 25% dari neonatus yang berhasil bertahan hidup seringkali mengalami komplikasi defisit neurologis permanen.[1]

Asfiksia merupakan penyebab tersering kematian neonatal. Penyebab selanjutnya yang tak kalah penting adalah kejadian bayi berat lahir rendah (BBLR).[2] Bayi berat lahir rendah (BBLR) didefinisikan sebagai bayi yang lahir dengan berat kurang dari 2500 gram tanpa memandang masa

gestasi. Menurut data *World Health Organization* (WHO), secara keseluruhan, diperkirakan 15 -20% dari total kelahiran di seluruh dunia termasuk dalam BBLR, dan ini mewakili lebih dari 20 juta kelahiran setahun.[3,4] Angka kejadian BBLR di Indonesia cukup bervariasi antara satu daerah dengan daerah lainnya dengan kisaran antara 9-30%.[5] Data Riskesdas menunjukan prevalensi BBLR di Bali mencapai 12,1%.[2]

Komplikasi yang umum terjadi pada bayi dengan BBLR antara lain gangguan pernapasan, hipotermi, gangguan imunologi, gangguan alat pencernaan, dan organ-organ yang belum matang serta belum berfungsi sempurna (termasuk hati, ginjal dan paru). Ketidakmatangan paru-paru berpengaruh signifikan terhadap kejadian asfiksia neonatorum. Defisiensi surfaktan dan perkembangan paru yang belum sempurna menyebabkan bayi kesulitan memulai pernafasan sehingga meningkatkan kemungkinan asfiksia neonatorum.[6]

Pemahaman yang mendasar mengenai hubungan antara BBLR dan asfiksia neonatorum menjadi sangat penting bagi dokter, sehingga dapat melakukan penanganan yang sesuai dan menurunkan angka morbiditas maupun mortalitas pada bayi. Penelitian mengenai hubungan antara BBLR dan asfiksia neonatorum juga belum pernah dilakukan di institusi penulis. Tujuan dari penulisan ini adalah untuk mengetahui hubungan antara bayi berat lahir rendah (BBLR) dengan asfiksia neonatorum di RSU Negara Periode Agustus 2019-Agustus 2020.

METODE

Penelitian ini merupakan penelitian analitik observasional potong lintang. Sebanyak 150 neonatus yang dirawat di Bagian *Neonatal Intensive Care Unit* (NICU) dan Perinatologi RSU Negara selama periode Agustus 2019 hingga Agustus 2020 diinklusi ke dalam penelitian. Neonatus dengan kelainan kongenital dan data rekam medis yang tidak lengkap dieksklusi dari penelitian. Sampel dipilih dengan menggunakan metode *systematic random sampling*. Penelitian ini sudah mendapatkan layak etik dari Komite Etik Penelitian (KEP) Fakultas Kedokteran Universitas Udayana dengan nomor No.2296/UNUN.14.2.2.VII.14/LT/2020.

Data berupa usia gestasi, jenis kelamin bayi, metode persalinan, berat badan lahir, dan skor APGAR neonatorum dikumpulkan dari rekam medis. Metode persalinan diklasifikasikan menjadi: 1) tindakan (persalinan dengan *sectio caesarea*, *vakum* atau *forceps*) dan, 2) spontan (persalinan spontan pervaginam). Asfiksia neonatorum ditentukan dengan menilai skor APGAR 1 menit pertama <7, diklasifikasikan menjadi: 1) asfiksia dan, 2) tidak asfiksia. Berat badan bayi rendah dikategorikan bila bayi lahir dengan berat <2500 gram. Usia gestasi diklasifikasikan menjadi: 1) *preterm* (usia gestasi <37 minggu) dan 2) tidak *preterm* (usia gestasi ≥37 minggu).

Variabel dalam penelitian ini meliputi variabel bebas yaitu BBLR, variabel tergantung yaitu asfiksia neonatorum, dan variabel perancu yaitu jenis kelamin bayi, metode persalinan, dan usia gestasi.

Data yang telah dikumpulkan selanjutnya diolah secara deskriptif dan analitik. Frekuensi dan persentase ditampilkan untuk masing-masing variabel. Uji chi-square digunakan untuk analisis bivariat pada semua sampel. Semua sampel dengan nilai uji bivariat <0,2 diikutsertakan dalam uji multivariat. Uji multivariat dengan uji regresi logistik ganda digunakan untuk mengidentifikasikan beberapa variabel yang berkaitan dengan asfiksia neonatorum dan didapatkan nilai *prevalence ratio* (PR). Hubungan dikatakan signifikan apabila diperoleh nilai p<0,05. Analisis data ini dilakukan dengan bantuan perangkat lunak menggunakan *Statistical Package for the Social Science* (SPSS) versi 21.

HASIL

Sebanyak 150 neonatus yang lahir dalam rentang waktu Agustus 2019 sampai dengan Agustus 2020 diinklusi dalam penelitian. Jumlah neonatus yang berusia <37 minggu adalah 31 (20,7%) neonatus dan cukup atau lebih bulan sejumlah 119 (79,3%) neonatus. Sebanyak 20 (20%) neonatus memiliki berat lahir ≤2500 gram, sedangkan sisanya sebanyak 120 (80%) neonatus memiliki berat lahir >2500 gram. Sebagian besar neonatus lahir dengan tindakan yaitu sebanyak 50,7%. Sebanyak 120 neonatus tidak mengalami BBLR (80%). Jumlah neonatus yang mengalami asfiksia neonatorum adalah 65 (43,3%). Karakteristik subyek dalam penelitian ini dapat dilihat pada Tabel 1.

Analisis bivariat menunjukkan adanya perbedaan kejadian asfiksia berdasarkan status BBLR dan cara persalinan (p<0,05). Tidak ada perbedaan kejadian asfiksia berdasarkan jenis kelamin dan usia preterm neonatus (Tabel 2).

Semua variabel yang signifikan dalam analisis bivariat diinklusi untuk dilakukan analisis multivariat dengan regresi logistik ganda. Hasilnya didapatkan bahwa BBLR secara independen berhubungan signifikan dengan kejadian asfiksia neonatus. Neonatus yang mengalami BBLR memiliki prevalensi 2,33 kali lebih tinggi untuk mengalami asfiksia dibandingkan dengan yang tidak mengalami BBLR (Tabel 3).

Tabel 1. Karakteristik subyek penelitian

Karakteristik	Frekuensi (n=150)	Persentase (%)
Usia Gestasi		
Preterm	31	20,7
Tidak preterm	119	79,3
Jenis Kelamin		
Laki-laki	77	51,3
Perempuan	73	48,7
Cara Persalinan		
Tindakan	76	50,7
Spontan	74	49,3
BBLR		
Ya	30	20,0
Tidak	120	80,0
Asfiksia		
Ya	65	43,3
Tidak	85	56,7

Tabel 2. Hubungan antara BBLR, usia gestasi, jenis kelamin, dan cara persalinan dengan kejadian asfiksia

	Asfiksia N (%)	Non-Asfiksia N (%)	PR (IK 95%)	Nilai p
BBLR				
Ya	18 (12,0)	12 (8,0)	2,330	0,039
Tidak	47 (31,3)	73 (48,7)	(1,029-5,275)	
Usia Gestasi				
Preterm	15 (10,0)	16 (10,7)	1,294	0,524
Tidak Preterm	50 (33,3)	69 (46,0)	(0,585-2,859)	
Jenis Kelamin				
Laki-laki	35 (23,3)	42 (28,0)	1,194	0,590
Perempuan	30 (20,0)	43 (28,7)	(0,625-2,281)	
Cara Persalinan				
Tindakan	39 (26,0)	37 (24,7)	1,946	0,046
Spontan	26 (17,3)	48 (32,0)	(1,010-3,749)	

Tabel 3. Analisis multivariat regresi logistik

	PR	IK 95%	Nilai p
BBLR	2,331	1,018-5,338	0,045
Cara Persalinan	0,514	0,265-0,999	0,050

PEMBAHASAN

Penelitian ini bertujuan untuk mengetahui hubungan antara berat badan lahir rendah (BBLR) dan kejadian asfiksia. Sebanyak 20% neonatus dalam penelitian ini dalam kategori BBLR dan 43,3% mengalami asfiksia. Angka ini lebih tinggi dibandingkan data Riskesdas[2] pada tahun 2013 yang menyatakan prevalensi BBLR di Bali mencapai 12,1%, namun sesuai dengan variasi kejadian BBLR di Indonesia yakni sekitar 9-30%.[5]

Hasil penelitian ini menunjukkan bahwa neonatus dengan BBLR memiliki prevalensi 2,33 kali lebih tinggi untuk mengalami asfiksia dibandingkan dengan yang tidak mengalami BBLR. Hasil ini sejalan dengan penelitian di Indonesia yang menunjukkan bahwa bayi dengan BBLR memiliki peluang sekitar 5 kali lipat untuk mengalami asfiksia dibandingkan dengan yang tidak BBLR.[7,8] Beberapa penelitian di negara berkembang juga menunjukkan hasil yang serupa.[9,10] Berat badan lahir yang semakin rendah juga ditemukan berkaitan dengan derajat asfiksia yang lebih berat. Penelitian oleh Gebreheat, dkk[11] pada 421 neonatus menunjukkan bahwa neonatus dengan berat lahir kurang dari 2,5 kg sekitar 12,75 kali mengalami asfiksia dibandingkan neonatus dengan berat 2,5-4 kg. Hasil yang sama juga didapatkan oleh Aslam, dkk[12] yang menunjukkan risiko asfiksia yang lebih tinggi pada neonatus dengan berat 1-2 kg dibandingkan dengan berat 2,5 sampai 3,5 kg.

Beberapa faktor lainnya seperti komplikasi maternal (hipertensi, diabetes mellitus pada masa prakonsepsi atau antepartum) dapat mendorong terjadinya BBLR.[10] Bayi dengan BBLR memiliki kondisi tubuh yang belum stabil sehingga lebih berisiko mengalami masalah kesehatan. Bayi yang lahir dengan BBLR juga memiliki surfaktan yang lebih sedikit, yang berfungsi untuk menurunkan tekanan permukaan paru dan membantu stabilisasi dinding alveolar sehingga tidak *collapse* di akhir ekspirasi.[13] Komplikasi pada bayi dengan BBLR dapat dijumpai dalam jangka pendek dan panjang. Dalam jangka pendek, sebagian besar bayi dengan BBLR dapat mengalami mortalitas akibat asfiksia berat (44%).[14]

Penelitian ini tidak menemukan adanya perbedaan kejadian asfiksia berdasarkan prematuritas. Hasil penelitian ini sejalan dengan penelitian di Ethiopia yang menunjukkan tidak adanya hubungan antara usia gestasi dengan kejadian asfiksia.[11] Neonatus yang lahir pada usia gestasional 34-37 minggu juga ditemukan menjadi faktor protektif terjadinya asfiksia.[12] Perbedaan hasil ditampilkan oleh sebagian besar penelitian-penelitian sebelumnya yang menunjukkan bahwa prematuritas merupakan faktor risiko terjadinya asfiksia neonatorum. Penelitian di salah satu rumah sakit di Jakarta menunjukkan bahwa bayi prematur memiliki risiko 3,1 kali lebih tinggi mengalami asfiksia dibandingkan dengan bayi yang cukup bulan.[15] Penelitian lainnya di Indonesia juga menunjukkan bahwa kejadian asfiksia lebih banyak dijumpai pada bayi prematur. Beberapa penelitian di negara berkembang lainnya juga menunjukkan adanya peningkatan kejadian asfiksia pada bayi yang lahir sebelum usia gestasi 37 minggu.[9,16] Penelitian

Published by DiscoverSys | *Intisari Sains Medis 2020*; 11(3): 1510-1514 | doi: 10.15562/ism.v11i3.871

oleh Abdo dkk[16] di Ethiopia Selatan menunjukkan bahwa persalinan *preterm* meningkatkan kejadian asfiksia 5 kali lebih tinggi. Penelitian oleh Nayeri dkk[9] di Iran juga menunjukkan bahwa usia gestasi <37 minggu dapat meningkatkan risiko kejadian asfiksia sebesar 2,57 kali.

Bayi yang lahir sebelum usia kehamilan 37 minggu memiliki organ yang imatur, termasuk paru-paru. Jumlah surfaktan di paru-paru bayi kurang bulan belum adekuat sehingga meningkatkan risiko kegagalan respirasi. Bayi prematur juga lebih rentan mengalami iskemik akibat belum sempurnanya pembentukan sawar darah otak.[10] Bayi yang lahir pada kelompok usia gestasi 28-32 minggu juga memiliki tingkat mortalitas yang lebih tinggi dibanding kelompok usia lainnya.[14] Hasil yang tidak signifikan dalam penelitian ini dapat disebabkan oleh pengelompokan bayi postmatur ke dalam kelompok postmatur, meskipun dalam beberapa penelitian menunjukkan bahwa post-maturitas pada bayi merupakan risiko terjadinya asfiksia neonatorum. Adanya infark dan fibrosis pada plasenta bayi yang postmatur dapat menyebabkan penurunan aliran darah dari plasenta ke janin.[7]

Cara persalinan juga ditemukan menjadi salah satu faktor terjadinya asfiksia dalam beberapa penelitian. Cara persalinan dalam penelitian ini diklasifikasikan menjadi dengan tindakan (*sectio caesarea, vakum*, atau *forceps*) dan spontan. Prevalensi persalinan dengan tindakan lebih banyak dijumpai (50,7%). Penelitian di RSUD Wangaya juga menunjukkan bahwa proses persalinan terbanyak adalah *sectio caesarea* yakni 54,1%.[6] Penelitian ini tidak menunjukkan bahwa cara persalinan berhubungan secara independen dengan kejadian asfiksia. Hasil ini sejalan dengan penelitian oleh Woday dkk[17] di Ethiopia pada 357 kelahiran yang menunjukkan bahwa cara persalinan tidak berhubungan dengan kejadian asfiksia dalam satu menit pertama kelahiran. Penelitian lain menunjukkan bahwa neonatus yang lahir melalui SC sekitar 7 kali lebih banyak mengalami asfiksia dibandingkan dengan neonatus yang lahir spontan pervaginam, namun tidak ditemukan perbedaan yang signifikan dari kejadian asfiksia antara bayi yang lahir spontan atau dengan bantuan.[11]

Hasil yang berbeda didapatkan oleh Utomo[18] yakni bayi yang lahir dengan metode persalinan *sectio caesarean* memiliki risiko mengalami asfiksia sebesar 3,7 kali. Penelitian oleh Kardana[19] di RSUP Sanglah menunjukkan bahwa persalinan dengan instrumen meningkatkan risiko terjadinya asfiksia pada neonatus sebesar 5,51 kali dibandingkan dengan yang tidak menggunakan instrumen. Persalinan secara *sectio caesarea* elektif diketahui memiliki efek protektif dengan menghindari beberapa faktor risiko seperti postmaturitas, mal-presentasi persisten, dan persalinan sulit.[19] Berbeda dengan SC gawat darurat yang biasanya berkaitan dengan kondisi patologis pada ibu dan janin. Neonatus yang lahir dengan tindakan SC gawat darurat memiliki risiko 28 kali mengalami asfiksia neonatorum.[9]

Penelitian ini memiliki beberapa kelebihan yakni: 1) peneliti telah menginklusi beberapa faktor perancu penting dan melakukan kontrol dengan analisis multivariat sehingga mendapatkan hasil hubungan yang independen dari BBLR dengan asfiksia, 2) jumlah sampel penelitian yang digunakan sudah mencukupi sesuai dengan perhitungan jumlah sampel minimal. Sayangnya, penelitian ini masih memiliki beberapa kekurangan, yaitu: 1) skor Apgar bukan menjadi indikator spesifik dari asfiksia, sedangkan pemeriksaan gas dan status keasaman darah yang lebih sensitif untuk menilai kondisi hipoksia dan asidosis tidak tersedia, 2) rancangan penelitian yang digunakan adalah potong lintang sehingga tidak dapat menentukan hubungan sebab-akibat antara BBLR dan asfiksia, 3) penelitian ini hanya dilakukan di satu instansi sehingga generalisasi pada populasi yang lebih luas akan sulit untuk dilakukan.

SIMPULAN

Berdasarkan uji multivariat dalam penelitian ini, berat badan lahir rendah berhubungan dengan kejadian asfiksia neonatorum. Prevalensi kejadian asfiksia neonatorum lebih tinggi pada bayi dengan berat badan lahir rendah.

UCAPAN TERIMA KASIH

Ucapan terima kasih penulis berikan kepada Departemen Ilmu Kesehatan anak, RSU Negara atas kesempatan dan bimbingan yang telah diberikan dalam penulisan penelitian ini.

KONFLIK KEPENTINGAN

Penulis menyatakan tidak terdapat konflik kepentingan (*conflict of interest*) pada penulisan laporan penelitian ini.

PENDANAAN

Penulis bertanggung jawab terhadap seluruh pembiayaan dalam pembuatan laporan penelitian ini.

KONTRIBUSI PENULIS

Penulis bertanggung jawab dalam pembuatan dan penulisan laporan penelitian ini.

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Published by DiscoverSys | *Intisari Sains Medis 2020*; 11(3): 1510-1514 | doi: 10.15562/ism.v11i3.871

Lampiran 8. Jurnal 3

Herb-Medicine Journal ISSN: 2620-567X

ANGKA KEJADIAN ASFIKSIA NEONATORUM PADA BAYI DENGAN BERAT BADAN LAHIR RENDAH DI RSUD GOETENG TAROENADIBRATA PURBALINGGA

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ABSTRAK

Latar Belakang: Angka kematian bayi di Indonesia sebagian besar disebabkan oleh berat bayi lahir rendah / BBLR (29%) dan asfiksia (27%). Asfiksia neonatorum adalah kegagalan bernapas secara spontan dan teratur segera setelah lahir dengan nilai APGAR < 7. Asfksia neonatorum dapat terjadi akibat BBLR. BBLR adalah bayi yang lahir dengan berat badan lahir kurang dari 2.500 gram tanpa menilai usia kehamilan. BBLR berisiko untuk mengalami kegagalan nafas yang akan menjadi asfiksia neonatorum, hal ini dikarenakan oleh kurangnnya surfaktan berdasarkan rasio lesitin atau sfingomielin kurang dari 2, disamping itu pada BBLR pertumbuhan dan pengembangan paru belum sempurna, otot pernapasan yang masih lemah dan tulang iga yang mudah melengkung (pliable thorax) sehingga bayi akan berisiko mengalami asfiksia.
Tujuan: Mengetahui angka kejadian asfiksia neonatorum pada bayi dengan berat badan lahir rendah.
Metode: Penelitian analitik observasional dengan pendekatan crossectional, melibatkan 67 subjek penelitian berupa data rekam medis yang diambil dari RSUD Goeteng Taroenadibrata Purbalingga, analisis data menggunakan uji Chi Square.
Hasil: Hasil analisis angka kejadian asfiksia neonatorum pada bayi dengan berat badan lahir rendah didapatkan nilai P value = 0,716 (P > 0,005)
Kesimpulan: Tidak terdapat hubungan antara BBLR dengan asfiksia neonatorum

Kata Kunci: Asfiksia, BBLR

ABSTRACT

Background: Infant mortality rate in Indonesia is mostly caused by low birth weight (29%) and asphyxia (27%). Asphyxia Neonatorum is a respiratory failure in which a newborn fails to breathe spontaneously and regularly right after birth with APGAR score < 7. It may occur due to low birth weight (LBW). LBW is a baby born with less than 2,500 grams birth weight, without assessing the age of the pregnancy. LBW is at risk for having the respiratory failure which leads to asphyxia neonatorum. This is caused by the lack of surfactant, in which based on lecithin or sphingomyelin ratio it is less than 2. In addition to LBW, the growth and the development of the lungs have not been completed yet, the breathing muscles are still weak, and the ribs are easily curved (pliable thorax). Thus, the baby will be at risk of having asphyxia.
Objectives: finding out the number of asphyxia neonatorum occurrence on low birth weight babies.
Methods: this is an observational analytical research with a cross-sectional approach involving 67 research subjects, in the form of medical record data, taken from RSUD Goeteng Taroenadibrata Purbalingga. The data were analysed through Chi-Square test.
Result: the analysis result of asphyxia neonatorum occurrence on low birth weight babies shows that the score of P-value = 0.716 (P > 0,005).
Conclusion: there is no correlation between low birth weight with asphyxia neonatorum.

Keyword: Asphyxia, LBW

Herb-Medicine Journal ISSN: 2620-567X

PENDAHULUAN

Salah satu indikator dalam menilai derajat kesehatan masyarakat adalah Angka Kematian Neonatus (AKN), Angka Kematian Bayi (AKB) dan Angka Kematian Balita (AKABA).[1] Menurut data hasil Survei Demografi dan Kesehatan Indonesia (SDKI) tahun 2012 AKN sebesar 19/1000 kelahiran hidup, AKB sebesar 32/1000 kelahiran hidup, AKABA sebesar 40/1000 kelahiran hidup. AKN di Jawa Tengah tahun 2015 sebesar 7,2/1.000 kelahiran hidup, AKB sebesar 10/1.000 kelahiran hidup, AKABA sebesar 11,6/1.000 kelahiran hidup[2], sedangkan AKN di Kabupaten Purbalingga tahun 2015 sebesar 98/1.000 kelahiran hidup, AKB sebesar 150/1.000 kelahiran hidup dan AKABA 174/1.000 kelahiran hidup.[3] Angka ini masih jauh dari target *Milenium Development Goals* (MDGs) tahun 2015 yaitu AKB diharapkan turun menjadi 23/1000 kelahiran hidup dan AKABA 32/1000 kelahiran hidup.

Menurut WHO diperkirakan sekitar 900.000 kematian bayi baru lahir setiap tahun diakibatkan asfiksia neonatorum. Kemenkes RI (2013) menyebutkan bahwa sejak tahun 2000 – 2003 asfiksia menempati urutan ke-6 yaitu sebanyak 8% sebagai penyebab kematian neonatus di seluruh dunia.[4] Asfiksia neonatorum adalah kegagalan bernapas secara spontan dan teratur segera atau beberapa saat Penyebab utama kematian neonatus di Indonesia adalah berat badan lahir rendah BBLR (29%) dan asfiksia (27%). BBLR pada tahun 2013 di Indonesia sebanyak 10,2%, angka kejadian BBLR tertinggi terdapat di provinsi Sulawesi Tengah (16,8%) dan terendah di Sumatera Utara (7,2%)[4], sedangkan di Kabupaten Purbalingga pada tahun 2015 bayi dengan berat badan lahir rendah dilaporkan sebanyak 781 (5.33%).[3]

Bayi berat lahir rendah (BBLR) adalah bayi yang lahir dengan berat badan lahir kurang dari 2.500 gram tanpa memandang masa kehamilan. Penyebab terjadinya bayi BBLR secara umum bersifat multifaktorial baik itu dari faktor ibu, faktor plasenta, dan faktor janin, maupun faktor yang lain. BBLR merupakan salah satu faktor utama yang berpengaruh terhadap kematian neonatus.[7]

Penelitian Afiana Rohmani menyebutkan bahwa BBLR preterm berisiko untuk mengalami kegagalan nafas yang akan menjadi asfiksia neonatorum, hal ini dikarenakan oleh kurangnnya surfaktan berdasarkan rasio lesitin atau sfingomielin kurang dari 2, disamping itu pertumbuhan dan pengembangan paru yang belum sempurna, otot pernapasan yang masih lemah dan tulang iga yang mudah melengkung (*pliable thorax*) dengan kondisi bayi akan berisiko mengalami hipoksia.[7]

Penelitian di atas memberi informasi bahwa terdapat hubungan antara asfiksia neonatorum dengan BBLR. Dalam penelitian ini, peneliti menggunakan data

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sekunder berupa rekam medik untuk melihat faktor-faktor yang menyebabkan kejadian BBLR disertai asfiksia. Berdasarkan hasil survey pendahuluan yang dilakukan di RSUD Goeteng Taroenadibrata Purbalingga bayi dengan berat badan 1000 – 2499 gram mempunyai harapan untuk bertahan hidup. Oleh karena itu, peneliti berkeinginan untuk menelaah tentang "Angka kejadian asfiksia neonatorum pada bayi dengan berat badan lahir rendah di RSUD Goeteng Taroenadibrata Purbalingga".

METODE

Jenis penelitian ini adalah *observasional analitik* dengan rancangan penelitian *crossectional*. Penelitian ini dilaksanakan di RSUD Goeteng Taroenadibrata Purbalingga pada bulan Januari 2018. Penelitian ini menggunakan populasi terjangkau yaitu seluruh pasien bayi baru lahir dengan berat badan lahir rendah pada periode bulan Januari sampai Desember tahun 2016 di RSUD Goeteng Taroenadibrata Purbalingga.

Teknik sampling yang digunakan dalam penelitian ini adalah *simple random sampling*. Besar sampel dibulatkan maka jumlah sampel dalam penelitian ini sebanyak 67 bayi.

Rumusan masalah bagaimana angka kejadian asfiksia neonatorum pada bayi dengan berat badan lahir rendah di RSUD Goeteng Taroenadibrata Purbalingga. Tujuan umum penelitian untuk mengetahui angka kejadian asfiksia neonatorum pada bayi dengan berat badan lahir rendah.

HASIL

Dalam penelitin ini data diambil dari RSUD Goeteng Taroenadibrata Purbalingga yaitu sebanyak 67 data rekam medis. Berdasarkan tabel I.2 didapatkan kasus BBLR sebanyak 41 kasus (61,1%), dan BBLSR 26 kasus (38,8%).

DISKUSI

Karakteristik yang dicantumkan pada penelitian ini diantaranya yaitu jenis kelamin, usia kehamilan, riwayat paritas ibu, riwayat persalinan ibu, riwayat penyakit ibu. Berdasarkan penelitian didapatkan bahwa jenis kelamin laki - laki paling banyak mengalami asfiksia yaitu 17 (25,3%) dan perempuan 8 (11,9%).

Riwayat usia kehamilan pada penelitian ini dibagi menjadi tiga yaitu aterm, preterm dan postterm. Preterm apabila subyek lahir pada usia kehamilan < 37 minggu, aterm apabila subyek lahir pada usia kehamilan 37-42 minggu, postterm apabila subyek lahir pada usia kehamilan > 42 minggu. Hasil penelitian menunjukkan bahwa bayi dengan riwayat kelahiran preterm yaitu aterm 8 (11,9%), preterm 17 (25,3%) , sedangkan untuk usia kehamilan postterm 0 (0%). Paritas ibu dibagi menjadi tiga yaitu primipara 17 (25,3%), multipara 8 (11,9%), grandemultipara 0 (0%). Riwayat persalinan ibu dibagi menjadi dua yaitu pervaginam 21 (31,3%)

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dan *Sectio Caesarea* (SC) 4 (5,9%). Riwayat penyakit ibu dibagi menjadi lima yaitu preeklampsia 6 (8,9%) , Ketuban Pecah Dini (KPD) 4 (5,9%) , perdarahan post partum 0 (0%) , plasenta previa 0 (0%) , normal 15 (22,3%).

Untuk mencari adanya hubungan BBLR terhadap asfiksia neonatorum telah dilakukan analisis menggunakan *uji chi squre,* didapat nilai P = 0,716 yang berarti H0 diterima dan H1 ditolak. Hasil penelitian ini menunjukkan bahwa tidak terdapat hubungan yang bermakna antara bayi berat badan lahir rendah dengan kejadian asfiksia neonatorum di RSUD Goeteng Taroenadibrata Purbalingga.

Hasil penelitian ini sesuai dengan penelitian Novia yang menjelaskan bahwa berat badan lahir pada sampel penelitian bukan satu-satunya faktor risiko yang mempengaruhi terjadinya asfiksia, dikarenakan asfiksia adalah kejadian dengan multifaktorial. [8] Hasil penelitian ini juga diperkuat dengan penelitian Vina yang memperoleh hasil analisis statistik yaitu nilai P = 0.292. Nilai tersebut menjelaskan bahwa nilai p-value > 0,05 yang berarti bahwa tidak ada hubungan antara bayi dengan berat lahir rendah dengan kejadian asfiksia neonatorum. [9]

Adriana melaporkan hasil yang berbeda, bahwa berat badan lahir rendah akan menimbulkan komplikasi medis yang lebih berpengaruh terhadap morbiditas dan mortalitas janin yang dilahirkan, hal ini disebabkan oleh kekurangan surfaktan, pertumbuhan dan pengembangan paru yang belum sempurna, otot pernapasan yang masih lemah dan tulang iga yang mudah melengkung, perdarahan intraventikuler. Oleh karena itulah bayi dengan BBLR atau prematur sering menderita apneu, asfiksia berat dan sindroma gangguan pernapasan.

Bayi berat lahir rendah lebih merupakan masalah penting dalam pengelolaannya karena mempunyai kecenderungan ke arah peningkatan terjadinya infeksi, asfiksia, ikterus dan hipoglikemi. Hasil penelitian yang menunjukkan tidak adanya hubungan yang signifikan antara BBLR dengan asfiksia neonatorum dapat terjadi karena pelayanan di RSUD Goeteng Taroenadibrata yang sudah cukup baik dari segi sumber daya manusianya serta alat-alat penunjang kesehatan yang tersedia.

Tabel. I.I Uji Pearson chisquare

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chisquare	132	1	0,716

Herb-Medicine Journal ISSN: 2620-567X

Tabel. I.2 Karakteristik BBLR

Karakteristik		Asfiksia		Tidak Asfiksia	
		N	%	N	%
Jenis Kelamin	Laki-Laki	17	25,3	20	29,8
	Perempuan	8	11,9	22	32,8
Riwayat Penyakit					
	KPD	4	5,9	7	10,4
	Preeklampsia	6	8,9	14	20,8
	Perdarahan Post	0	0	1	1,4
	Plasenta Previa	0	0	1	1,4
	Normal	15	22,3	19	28,3
Usia Kehamilan	Aterm	8	11,9	18	26,8
	Preterm	17	25,3	21	31,3
	Postterm	0	0	3	4,4
Paritas	Primipara	17	25,3	32	47,7
	Multipara	8	11,9	7	10,4
	Grandemultipara	0	0	3	4,4
Riwayat Persalinan	Pervaginam	21	31,3	28	41,7
	SC	4	5,9	14	20,8

SIMPULAN

Berdasarkan hasil penelitian angka kejadian asfiksia neonatorum pada bayi dengan berat badan lahir rendah di RSUD Goeteng Taroenadibrata Purbalingga didapatkan kesimpulan sebagai berikut :

1. Angka kejadian asfiksia neonatorum pada bayi dengan berat badan lahir rendah yaitu 25 bayi
2. Tidak terdapat hubungan antara BBLR dengan asfiksia neonatorum.

UCAPAN TERIMAKASIH

Saya ucapkan terimakasih kepada seluruh keluarga besar dan civitas akademika Fakultas Kedokteran Universitas Muhammadiyah Purwokerto yang telah mendukung pembuatan artikel ini.

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Lampiran 9. Jurnal 4

Midwifery 73 (2019) 1–7

Contents lists available at ScienceDirect

Midwifery

journal homepage: www.elsevier.com/locate/midw

Maternal determinants of low birth weight and neonatal asphyxia in the Upper West region of Ghana ☆

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ARTICLE INFO

Article history:
Received 29 July 2018
Revised 19 January 2019
Accepted 21 February 2019

Keywords:
Pregnancy outcome
Birth weight
Neonatal asphyxia
Maternal determinants
Upper West Region
Ghana

ABSTRACT

Background: Adverse birth outcomes continue to be a global public health challenge, particularly in low resource settings. Therefore, the present study aimed at assessing maternal determinants of low birth weight and neonatal asphyxia in the Upper West region of Ghana.

Methods: An analytical cross sectional survey was conducted among mothers who attended child welfare clinics (CWC) in six sub-districts. Pregnancy outcome data and maternal nutritional, health service and socio-demographics were obtained using a pre-tested questionnaire. Determinants of low birth weight (LBW) and neonatal asphyxia were analyzed using chi-square and multivariable logistic regression modelling.

Results: The results showed that the prevalence of low birth weight and neonatal asphyxia were 8.2% and 9.3% respectively. Multiple logistic regression showed that the risk of giving birth to a LBW baby was high among mothers who consumed alcoholic beverages [AOR = 5.93; 95% CI (1.22–28.84); $p = 0.03$], those who had food taboos during pregnancy [AOR = 3.31; 95% CI (1.02–10.77); $p = 0.047$] and not having additional meals [AOR = 3.16; 95% CI (1.0–10.0); $p = 0.05$] during pregnancy. Neonatal asphyxia was higher among new born babies whose mothers did not receive nutritional counselling in pregnancy [AOR = 5.64; 95% CI (1.48–21.60); $p = 0.01$] and those who had anaemia at 36 weeks gestation [AOR = 2.69; 95% CI (0.95–7.65); $p = 0.06$].

Conclusion: Maternal dietary practices during pregnancy could positively affect birth outcome in the Upper West Region of Ghana.

Background

Nutrition and fitness are crucial for maternal and foetal growth and development. The mother solely provides the basic precursors or building blocks for the foetal growth and development. These building blocks in turn set the pace and to a larger extent determine the survival as well as long term impact on health (Barker, 1997). Poor maternal health and nutritional status have been related to adverse birth outcomes such as low birth weight. macrosomia, neonatal asphyxia, still births, postpartum haemorrhage and maternal deaths (Abu-Saad and Fraser, 2010).

Low birth weight (LBW) is defined by WHO as a birth weight less than 2500 g (up to and including 2499 g) (UNICEF/WHO, 2004; WHO, 2010). It is determined by two processes; duration of gestation and intrauterine growth (WHO, 1995; Urquia and Ray, 2012). Therefore A baby's low weight at birth is either the result of preterm birth (before 37 weeks of gestation) or due to restricted foetal (intrauterine) growth (UNICEF/WHO, 2004) Maternal determinants of birth outcome are complex, interrelated and vary widely in different populations and may include biologic, socioeconomic, and demographic factors (Abu-Saad and Fraser, 2010).

Birth weight is reported to be affected to a greater extent by the mother's own poor foetal growth and diet from the period of her own birth to the recent pregnancy, and also, her body composition at conception (Cate Joyce, 2012). Mothers in deprived

Abbreviations: ANC, Antenatal care; CHPS, Community-based health planning services; CWC, Child welfare clinic; LBW, Low birth weight.

☆ Declarations Conflict of interests: None decleared. Ethics and consent to participate: Ethical clearance for this study was obtained from the Institutional Review Board (IRB) of the Navrongo Health Research Center (NHRCIRB299). The respondents were given explanations on the purpose of the interview who signed or thumb printed informed consent forms before recruitment into the study. Participation was purely voluntary. Funding: None declared. Availability of data: The data supporting the conclusions of this article are included within the manuscript. The dataset could be obtained from the corresponding author upon reasonable request.

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https://doi.org/10.1016/j.midw.2019.02.012
0266-6138/

socio-economic conditions commonly have low birth weight infants (Cate Joyce, 2012). This problem could be compounded by demanding workload during pregnancy for women in these settings (Cate Joyce, 2012). Low birth weight due to restricted foetal growth is found to affect the person throughout life and is associated with poor growth in childhood and a higher incidence of adult diseases, such as hypertension, cardiovascular disease, and type 2 diabetes. An additional risk for girls is having smaller babies when they become mothers (Gray et al., 2004) perpetuating the intergenerational cycle of malnutrition. Also, low birth weight places infants at risk of longer initial hospital stays, neurological impairments, low IQ scores, higher hospital costs, health complications such as chronic lung disease or brain haemorrhaging, and developmental problems such as language delays, attention and emotional disorders (Sharma and Mishra, 2013; Sutan et al., 2014).

Neonatal asphyxia, also called birth asphyxia, is the inability of an infant to establish regular respiration following birth (Bax and Nelson, 1993). The condition results from an inadequate supply of oxygen (http://www.wisegeek.org/what-is-oxygen.htm) to an infant while in the womb or during the delivery process (Ariawan et al., 2011). Babies whose cells do not get enough oxygen for a longer time may have permanent injury to their brain, heart, lungs, kidneys, bowels or other organs or may result in foetal death (Aslam et al., 2014; Daripa et al., 2013; Organization, 2012). About 23% of neonatal deaths in low-income countries are due to neonatal asphyxia (Paul, 1999). Preconception risk factors for neonatal asphyxia include maternal age above 35 years, family history of seizures or neurologic disease, social factors, infertility treatment, previous neonatal death (Aslam et al., 2014; Gane et al., 2013; Samad et al., 2016). Other risk factors may include maternal disease, multiple gestation, intrauterine growth restriction, breech presentation, antepartum hemorrhage and foetal heart rate during labour (Aslam et al., 2014; Samad et al., 2016).

In Ghana, a low birth weight prevalence rate below 10% has previously been reported (Fosu et al., 2013). A higher prevalence above 20% has however, been reported in the Northern parts of Ghana (Abubakari et al., 2015). Low birth weight is said to be influenced by some factors including maternal age (Fosu et al., 2013; Silvestrin et al., 2013), prematurity, foetal stress (Sharma and Mishra, 2013) anthropometric factors such as maternal pre pregnancy weight and height (Abubakari et al., 2015; Sharma and Mishra, 2013), and previous history and nutritional deficiency (Isiugo-Abanihe and Oke, 2011; Silvestrin et al., 2013).

As determinants of birth outcome are wide and vary from place to place, identifying local determinants is necessary if interventions targeting their reduction were to be effective. The present study therefore, sought to assess the maternal determinants of neonatal asphyxia and low birth weight in the Upper West region, which is located in the Northern part of Ghana.

Methods

Study design and setting

This study was a facility based cross sectional survey conducted in the Lambussie district of the Upper West region of Ghana. Lambussie is one of the 11 districts in the Upper West Region and one of the poorest districts in the region. The study covered the six sub-districts (Hamile, Billaw, Piina, Karni, Samoa and Lambussie). These sub districts comprised of five health centers, one polyclinic and nineteen Community Health and Planning Services zones (CHPS). Five out of the six sub districts are mostly rural and only one is peri–urban. The major occupation of the people in the Lambussie district is agriculture and related activities (Ghana Statistical Service, 2012).

The study covered all the 25 public health facilities in the district. These sub-districts represented a mix of peri–urban and rural communities.

Study population and sampling

The study population comprised mothers with babies that were less than 90 days who were receiving post-natal and child welfare clinic services. Women who have given birth in the previous 90 days were more likely to recount their experiences during pregnancies to meet the purpose of the study. For the purpose of measuring the outcome variables of interest, only women who delivered in health facilities with recorded birth outcomes (birth weight and apgar scores) were recruited.

The minimum required sample for this study was calculated using the formula for estimating single proportions with a 95% confidence interval, a 5% margin of error and 9.2% prevalence of low birth weight from a similar study in Ghana (Fosu et al., 2013), hence a sample size of 190 was generaed. The study categorized the district into strata (sub-districts) and each stratum was assigned a sample proportional to its estimated size. Billaw subdistrict (26 respondents), Hamile sub-district of (45 respondents), Karni sub-district (36 respondents), Lambussie sub-district (15 respondents), Piina sub-district (21 respondents) and Samoa subdistrict (40 respondents). In each sub-district, the study included only health facilities that had designated midwife, trained community health officer and/or medical doctor at the facility and further assigned these facilities a quota of the sub-district sample size per their percentage of expected annual ANC deliveries. In all, 183 questionnaires were fully completed representing 96.3% response rate.

Measurement of outcome and exposure variables

A structured questionnaire was used in collecting quantitative data from respondents by a team of trained community health officers and midwives. The study measured several variables but the present paper only focused on maternal risk predictors in relation to birth outcomes (asphyxia and low birth weight). Birth weight and Apgar score at birth were measured as continuous variables. Primary data were obtained directly from the respondents, which included, socio-demographic information, maternal occupation; food taboos (foods that are culturally forbidden to eat during the period of pregnancy. In this particular study they included eggs, fish, organ meat such as liver, heart, offals etc. and mangoes) as well as dietary history and whether the mother took additional meal (Meals taken by the pregnant women in addition to their routine daily meal frequency to cater for the extra demand imposed by the pregnancy). Place of delivery, SP (Sulfadoxine pyrimethamine) does during pregnancy, postpartum hemorrhage, nutrient supplementation, & counseling, records on pregnancy classes, and Apgar scores and birth weight were taken from mother's pregnancy antenatal booklets (maternal health records booklets).

Data analysis

The data was entered and clean using SPSS version 22.0 for Windows. During the data cleaning process measurements recorded from the antenatal records which were either too high or too small were excluded or dropped. Descriptive statistics include means and standard deviations for continuous variables and, frequencies and percentages for categorical variables. Birth weight was classified as normal birth weight (birth weight $\geq$ 2.5 kg) and low birth weight (birth weight $<$ 2.5 kg) (UNICEF/WHO, 2004; WHO, 2010). Apgar scores were classified as normal ($\geq$7 Apgar

Table 1
Sociodemographic characteristics of mothers.

Characteristic	Frequency (n)	Percentage (%)
Age group (years)		
<20	16	8.7
20–30	116	63.4
>30	51	27.9
Ethnicity		
Dagaaba	111	60.7
Sissala	51	27.9
Moshi	8	4.4
Others	13	7.1
Religion		
Christianity	111	60.7
Islam	54	29.5
African traditional religion	18	9.8
Marital status		
Single	4	2.2
Married	178	97.3
Separated	1	0.5
Educational attainment		
No formal education	82	44.8
Primary school	54	29.5
Secondary school	35	19.1
Tertiary	12	6.6
Work		
Farmer	132	72.1
Petty trader	27	14.8
Formal sector	8	4.4
House wife	16	8.7
House ownership		
Tenant	20	10.9
Owner	155	84.7
Other arrangement	8	4.4
Residence		
Rural dweller	159	86.9
Urban dweller	24	13.1
Delivery place		
CHPS compound	20	10.9
Clinic	83	45.4
Polyclinic/hospital	80	43.7
Alcohol intake during pregnancy		
No alcohol	82	44.8
Took alcohol	101	55.2
Smoking during pregnancy		
No	182	99.5
Yes	1	0.5
Nutrition counselling during pregnancy		
Yes	170	92.9
No	13	7.1
Intake of additional meal during pregnancy		
Yes	139	76.0
No	44	24.0
Intake of food groups during pregnancy		
2–3	101	55.2
Above 3	82	44.8
Food taboos during pregnancy		
Yes	44	24.0
No	139	76.0
Compliance with dietary supplement intake		
Fully complied	152	83.5
Partially complied	27	14.8
Did not comply	3	1.6
SP doses during pregnancy		
<2	42	23.0
2–3	131	71.6
>3	10	5.5
Gestational weight gain		
Low	169	92.3
Adequate	9	4.9
Excessive	5	2.7
Apgar scores		
Severe/moderate asphyxia	17	9.3
Normal asphyxia	166	90.7
Birth weight		
Normal	168	91.8
Low	15	8.2
Post- partum hemorrhage		
Yes	13	7.1
No	170	92.9

(continued on next page)

Table 1 (*continued*)

SP- Sulfadoxine pyrimethamine.

score) and severe/moderate asphyxia (<7 Apgar score). Bivariate analyses were done using chi-square statistics /Fisher's Exact test as first line analysis to identify predictors of both low birth weight and neonatal asphyxia. We examined effect sizes of exposure variables as well as *p*-values of bivariate analysis before inclusion in multivariate logistic regression analysis. Given the size of our study, variables that had p-values of 0.3, showed the most effect and improved multivariable models were included. Even though marital status, education, smoking status and occupation showed some evidence of association with low birth weight with Exact test, we did not include them in multivariable modeling because they had poor distribution with birth weight and did not improve the models. For example, only one participant each had a low birth weight for unmarried, smokers, other workers and low educated mothers. In addition, we did not include gestational age at delivery because it did not improve the model.

Similarly, we have not included receiving anaemia counseling in the multivariate model for neonatal asphyxia as it does not improve the model once anaemia at 36 weeks gestation is included.

Ethical considerations

The mothers were asked to sign a written consent form. For those who could not read and write, this was done through an interpreter. The guardians or parents were asked to sign a written parental or guardian form on behalf of the minors, while the minors were asked to sign an assent form. The Ethics committee of Navarongo Health Research Centre (Ref. No: NHRCIRB299) approved this study. The study was conducted between September 2017 and June 2018.

Results

Socio-demographic, obstetric and birth characteristics

The socio-demographic characteristics data of mothers are presented in Table 1. The results showed that majority (63.4%) of the mothers were aged 20–30 years while only 8% were aged below 20 years. Mothers were largely from the Dagaaba ethnic group (60.7%) and practiced Christianity (60.7%). Almost all (97.3%) of the mothers were married and mostly had no formal educational attainment (44.8%). The main occupation of sampled mothers was farming (72.1). Majority of the mothers lived in their own houses (84.7%) in rural settlements (86.7%) and delivered in a clinic (45.4%). A substantial number of the respondents (43.7%) also delivered in a polyclinic. Also, more than half of the mothers reported alcohol consumption during pregnancy (55.2%) but not smoking (99.5%). More than nine in ten mothers received nutrition counseling (93.0%) and took an additional meal (Meals taken by the pregnant women in addition to their routine daily meal frequency to cater for the extra demand imposed by the pregnancy) during pregnancy (76.0%). Most mothers reported daily intake of at least three food groups (55.2%). Food taboos during pregnancy were reported among at least two in ten mothers (24.0%). Majority of mothers showed high compliance with supplements given during pregnancy (83.5%) and took 2–3 doses of SP during pregnancy (71.6%). Low gestational weight gain was high among moth-

Table 2
Predictors of low birth weight among mothers.

variable	Low birth weight n/N (%)	Test statistic, *p*-value
Age group (years)		$\chi^2 = 0.43$,
<20	2/16(12.5)	0.51
>20	13/116(7.8)	
Ethnicity		$\chi^2 = 0.25$,
Dagaaba	10/111(9.0)	0.62
Others	5/72(6.9)	
Marital status		$\chi^2 = 0.95$,
Currently married	14/178(7.9)	0.33
Currently unmarried	1/5(20.0)	
Educational attainment		$\chi^2 = 3.10$,
No/primary education	14/136(10.3)	0.08
Secondary/tertiary education	1/47(2.1)	
Occupation		$\chi^2 = 3.65$,
Farmer	14/132(10.6)	0.06
Other	1/51(2.0)	
Residence		$\chi^2 = 0.60$,
Rural	14/159(8.8)	0.44
Urban	1/24(4.2)	
Alcohol intake during pregnancy		$\chi^2 = 6.55$,
Took alcohol	13/101 (12.9)	0.01
No alcohol	2/82 (2.4)	
Smoking during pregnancy		Exact
Yes	1/1(100)	test,
No	14/182(7.7)	0.08
Food taboos during pregnancy		$\chi^2 = 4.58$,
Yes	7/44 (15.9)	0.03
No	8/139 (5.8)	
Intake of additional daily meal		$\chi^2 = 7.68$,
Yes	7/139 (5.0)	0.006
No	8/44 (18.2)	
Nutritional counselling during pregnancy		$\chi^2 = 0.96$,
Yes	2/13 (15.4)	0.33
No	13/170(7.6)	
Anaemia at 36 weeks gestation		$\chi^2 = 0.56$,
Yes	7/69(10.1)	0.46
No	8/114(7.0)	
Gestational age at delivery		$\chi^2 = 4.16$,
Full term	11/163 (6.7)	0.04
Pre- term	4/20 (20)	
Gestational weight gain		$\chi^2 = 0.02$,
Adequate/excessive	1/14(7.1)	0.88
Low	14/169(8.3)	
SP doses during pregnancy		$\chi^2 = 5.20$,
Less than 2	7/42(16.7)	0.02
≥2	8/141(5.7)	
Compliance with supplement intake		$\chi^2 = 0.15$,
Fully complied	12/152(7.9)	0.70
Partial/non-compliance	3/30(10.0)	
Illness during delivery month		$\chi^2 = 0.60$,
Yes	4/35(11.4)	0.44
No	11/148(7.4)	

ers (92.3%) while only 5% had adequate weight gain. Most mothers did not experience post -partum hemorrhage (92.9%), delivered babies who had normal weight (92%) and normal Apgar scores (90.7%) (Table 1).

Determinants of birth weight

The Bivariate analysis showed that maternal alcohol consumption, food taboos, having an additional meal during pregnancy and gestational age at delivery was associated with low birth weight. For example, alcohol intake during pregnancy was associated with low birth weight ($p = 0.011$) (Table 2) Mothers who did not take some foods that were forbidden for pregnant women had more low birth weight compared to those who did not taboo any food during pregnancy ($p = 0.032$). Low birth weight babies were high among mothers who did not have an additional meal to their normal meals during pregnancy ($p = 0.006$) and mothers who delivered preterm were more likely to have low birth weight babies ($p = 0.041$) (Table 3).

Multivariate analysis was also done by estimating a logistic regression model for predictors of low birth weight, which showed that mothers who consumed alcohol during pregnancy were about 6 times more likely to have low birth weight babies compared to those who did not have alcohol during pregnancy [AOR = 5.93; 95% CI (1.22–28.84); $p = 0.03$]. Mothers who tabooed some foods during pregnancy also had increased risk of having low birth weight babies compared to those who did not [AOR = 3.31; 95% CI (1.02–10.77); $p = 0.047$]. The model also show some evidence of increased risk of low birth weight among mothers who did not have additional meals during pregnancy compared to those who had additional meals [AOR = 3.16; 95% CI (1.0–10.0); $p = 0.05$]. There was weak evidence for increased risk of low birth weight among mothers who took less than 2 SP during pregnancy [AOR = 2.45; 95% CI (0.76–7.90); $p = 0.13$] (Table 3).

Table 3
Determinants of low birth weight.

Factor	A.O.R	p-value	95% C.I for A.O.R	
			Lower	Upper
Alcohol intake during pregnancy				
No	1			
Yes	5.93	0.03	1.22	28.84
Food taboos during pregnancy				
No	1			
Yes	3.31	0.047	1.02	10.77
Additional daily meal during pregnancy				
Yes	1			
No	3.16	0.05	1.0	10.0
SP doses in pregnancy				
≥2	1			
Less than 2	2.45	0.13	0.76	7.90
Constant	0.027	<0.001		

Determinants of neonatal asphyxia

Neonatal asphyxia was associated with nutritional counselling during pregnancy ($p = 0.022$), anaemia education during pregnancy ($p = 0.044$) and being anaemic at 36 weeks of gestation ($p = 0.06$) (Table 4).

Multivariate analysis was also done by estimating a logistic regression model for predictors of neonatal asphyxia, which showed that mothers who did not receive nutritional counselling during pregnancy were about 6 times more likely to have babies with asphyxia compared to those who received nutrition counselling [AOR = 5.64; 95% CI (1.48–21.60); $p = 0.01$]. The model also show some evidence that mothers who were anaemic at 36 weeks of gestation had increased risk of having babies with neonatal asphyxia compared to those who were not anemic [AOR = 2.69; 95% CI (0.95–7.65); $p = 0.06$] (Table 5).

Discussion

The present study sought to determine the prevalence and determinants of low birth weight and neonatal asphyxia among mothers in the Upper West region of Ghana. The main findings are that the prevalence of low birth weight and neonatal asphyxia were 8.2% and 9.3% respectively. Maternal alcohol intake, not having additional meals during pregnancy and food taboos during pregnancy predicted low birth weight. Maternal receipt of nutritional counselling and anaemia education during pregnancy were also associated with neonatal asphyxia.

The prevalence of low birth weight in the present study is similar to that reported from some western countries (Organization, 2014). The prevalence is lower than those reported from Sub-Saharan Africa (13%), and West and Central Africa (14%) (WHO, 2014). A slightly higher prevalence of low birth weight has been reported earlier by the Ghana Multiple Indicator Cluster Survey (Ghana Statistical Service, 2011) which reported 11% prevalence and the Ghana Demographic and Health Survey report of 12.1% in the region (Ghana Statistical Service, 2015). Our finding is similar to the 9.2% in Ghana reported by Fosu et al. (2013) but much lower than the 26% in the Northern region of Ghana (Abubakari et al., 2015), which share similar geographic characteristics with the study area. The lower prevalence in the present study could be a result of a gradual reduction in the prevalence of low birth weight over the years in Ghana.

Mothers who had history of alcohol intake during pregnancy were more likely to have low birth weight babies. Reduced birth weight and maternal pregnancy alcohol intake has been reported earlier in a prospective study (Vaktskjold et al., 2010) where as high as 100 g reduction in birth weight was found among pregnant

Table 4
Predictors of neonatal asphyxia.

Variable	Neonatal asphyxia n/N(%)	Test statistic, p-value
Age group (years)		$\chi^2 = 0.21$,
<20	2/16(12.5)	0.64
>20	15/167(9.0)	
Ethnicity		$\chi^2 = 0.47$,
Dagaaba	9/111(8.1)	0.49
Others	8/72(11.1)	
Marital status		Exact test,
Currently married	17(9.6)	1.00
Currently unmarried	0/5(0.0)	
Educational attainment		Exact test,
No/primary education	14/136(10.3)	0.57
Secondary/tertiary education	3/47(6.4)	
Occupation		Exact test,
Farmer	12(9.1)	1.00
Other	5/51(9.8)	
Residence		Exact test,
Rural	14/159(8.8)	0.47
Urban	3/24(12.5)	
SP doses during pregnancy		$\chi^2 = 0.004$,
Less than 2	4/42(9.5)	0.95
≥2	13/141(9.2)	
Compliance with supplement intake		$\chi^2 = 0.68$,
Fully complied	13/152(8.6)	0.41
Partial/non-compliance	4/30(13.3)	
Alcohol intake during pregnancy		$\chi^2 = 0.10$,
Took alcohol	10/101 (9.9)	0.80
Did not take alcohol	7/82 (8.5)	
Smoking during pregnancy		Exact test,
Yes	0/1 (0.0)	1.00
No	17/182 (9.3)	
Place of delivery		$\chi^2 = 0.80$,
CHPS compound	2/20(10.0)	0.67
Clinic/Health centre	6/83(7.2)	
Polyclinic/hospital	9/80(11.2)	
Nutritional counselling during pregnancy		Exact test,
Yes	13/170 (7.6)	0.02
No	4/13 (30.8)	
Food taboos during pregnancy		Exact test,
Yes	2/44(4.5)	0.40
No	15/139(10.8)	
Received counseling on anaemia		Exact test,
Yes	12/160 (7.5)	0.04
No	5/23 (21.7)	
Anaemia at 36 weeks gestation		$\chi^2 = 3.56$,
Yes	10/69 (14.5)	0.06
No	7/114 (6.1)	
Gestational weight gain		$\chi^2 = 0.45$,
Adequate/excessive	2/14(14.3)	0.50
Low	15/169(8.9)	
Gestational age at delivery		Exact test,
Full term	15/163(9.2)	1.00
Pre- term	2/20(10.0)	
Illness during delivery month		Exact test,
Yes	4/35 (8.8)	0.75
No	13/135 (8.8)	

[a]Fisher's Exact statistic.

Table 5
Determinants of neonatal asphyxia.

Factor	A.O.B	p-value	95% C.I for A.O.R	
			Lower	Upper
Nutritional counselling during pregnancy				
Yes	1			
No	5.64	0.01	1.48	21.60
Anaemia at 36 weeks gestation				
No	1			
Yes	2.69	0.06	0.948	7.65
Constant	0.05	<0.001		

women who consume alcohol. Alcohol intake in the present study included a local alcoholic beverage called "Pito" and other forms of alcohols. Alcohol intake is generally not recommended during pregnancy, however, mothers might still indulge in the intake of the local alcoholic beverages during pregnancy in this area as the local alcoholic beverage appeared as a regular drink. It seems plausible therefore, for mothers to receive education on the dangers of alcohol intake during pregnancy especially intake of the local alcoholic beverage (Pito) in the region and other parts of Ghana where pito is a stapel drink. Mothers who reported some food taboos were also more likely to have low birth weight babies. Food taboos among pregnant women have been reported earlier (Mukhopadhyay and Sarkar, 2009). However, associations of food taboos during pregnancy and birth outcomes have rarely been reported. The association found in the present study may mean that potentially nutritious foods such as animal source are tabooed during pregnancy which hinder the attainment of maternal nutrient requirements and fetal needs. Myths surrounding intake of some foods during pregnancy need to be identified and used to educate pregnant women for optimal nutrition. Mothers who reported having an additional meal, promoted as the "3 plus 1" diet during pregnancy were less likely to have low birth weight babies. The importance of diet in the attainment of optimal maternal and fetal well-being cannot be over emphasized. In low resource settings where diet quality is likely to be poor, increased dietary intake with variety may be useful in meeting nutritional requirements during pregnancy.

The study also recorded prevalence of neonatal asphyxia of 9.3% in the study population. The World Health Organization acknowledges the difficulty in estimating accurately the rates of birth asphyxia particularly at the community level (Organization, 2014). In the current study, about 11% of the respondents delivered at CHPS facilities, which mostly do not have the capacity to conduct deliveries and the necessary skills to estimate birth asphyxia. As there is currently no gold standard for the diagnosis of birth asphyxia, comparisons with previous studies is problematic. As such, the prevalence rate in this study may only serve as an indication of the existence of this birth abnormality in the area and is more likely an underestimate of the actual prevalence. Notwithstanding this, estimates of neonatal asphyxia are critical especially in low resource setting where these estimates are hardly made (Daripa et al., 2013). The prevalence rate in the current study is similar to the rates reported from India (Agarwal et al., 2008) but slightly higher than in Bangladesh (Sampa et al., 2012). The prevalence rates reported from Nigeria are much higher where 21.1% neonatal asphyxia has been reported (Ilah et al., 2015). These differences could be due mainly to the different levels of health care provision and capacity level variations in different areas.

The present study reports an association between maternal nutrition counselling and neonatal asphyxia. Mothers who received nutrition counseling during pregnancy were less likely to be asphyxiated babies. Nutrition counseling may lead to improved dietary practices during pregnancy, which could be protective against neonatal asphyxia.

The interpretation of the present study results should be made with caution. We did not include some variables that showed some evidence of association with our outcome measures in the logistic regression models due to poor distribution with the outcome measures. The study sample may not also give us power to model more variables and detect meaningful effects. However, as studies exploring these outcomes are not common in the area, these findings could be useful in generating hypotheses, which could be explored in larger future studies. Authors did not also measure birth weight and neonatal asphyxia directly; data on these were recorded from relevant maternal antenatal books. Extreme values were however, excluded from the data therefore, the estimates provided are more likely to be representative of the population. In spite of these limitations, the present study has provided ample light on the prevalence and determinants of low birth weight and neonatal asphyxia in the Upper West region of Ghana.

Conclusion

In summary the study showed that low birth weight prevalence in Lambussie District is lower than the national averages and the most important predictors included maternal alcohol intake, having additional meal during pregnancy and food taboos. Implying that improving maternal dietary practices during pregnancy could affect birth outcome in Lambussie district of the Upper West region, Ghana.

Acknowledgements

We expressed our sincere gratitude to all mothers who participated in this study. Our warmest gratitude also goes to the Midwives and Community Health Officers who assisted with the administration of the questionnaires to the respondents.

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Biomedical Research and Therapy, 7(9):4010-4015

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Report

Preterm birth and low birth weight in neonates with postnatal respiratory failure at a tertiary hospital in Viet Nam

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ABSTRACT

Introduction: This study aimed to evaluate the rate of preterm birth and low birth weight in neonates having postnatal respiratory failure. **Methods**: A cross-sectional design was used in the study. There were 139 neonates with postnatal respiratory failure and 278 neonates without respiratory failure included in the study. Data on comorbidities, gestational age, and mechanical ventilation status were collected. **Results:** Among neonates with respiratory failure, the rate of preterm birth (< 37 weeks) was 70.5%. The average gestational age and weight of the respiratory failure group were significantly lower compared to the control group ($p < 0.001$). Asphyxia, patent ductus arteriosus, and hyaline membrane were the most common causes of respiratory failure. The rate of neonates having less than 37 gestational weeks and requiring mechanical ventilation as treatment for respiratory failure was 73.5%, in which the proportion of neonates born before 32 gestational weeks was 47.1% ($p < 0.001$). **Conclusion:** The rates of preterm birth and low birth weight among infants with respiratory failure in a tertiary hospital in Vietnam were significantly high. Causes of preterm birth and low birth weight were preventable and treatable if having appropriate care and treatment plan.

Key words: Neonatal respiratory failure, preterm birth, low birth weight

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History

- Received: May 28, 2020
- Accepted: Sep 18, 2020
- Published: Sep 30, 2020

DOI : 10.15419/bmrat.v7i9.633

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INTRODUCTION

Respiratory failure is a common phenomenon in neonates and a main cause of neonatal treatment in intensive care units. A previous report indicated that one-third of neonates with respiratory failure who were hospitalized were preterm infants[1]. The mortality rate of preterm birth is high in Vietnam. Data of the World Health Organization (WHO) reported that 18% of premature babies died in Vietnam in 2012[2]. Hyaline membrane disease, meconium aspiration syndrome, pneumonia, pulmonary hemorrhage, and congenital heart defects are the leading causes of respiratory failure[2,3]. Previous reports in the literature have shown that gestational age and birth weight have bidirectional associations with neonatal respiratory failure[4–7].

Although preterm birth and low birth weight in neonates with postnatal respiratory failure are thoroughly investigated in the literature, limited evidence has been found in Vietnam. This study aimed to measure the rate of preterm birth and low birth weight in neonates with postnatal respiratory failure in Bach Mai Hospital, a tertiary hospital in Vietnam. This information will help clinicians to develop care and treatment protocols, support resuscitations, and have appropriate post-natal care after birth in order to limit complications of postnatal respiratory failure.

METHODS

Study design and participants

A cross-sectional study was conducted at the neonatal Intensive Care Unit (ICU) at the Department of Pediatrics, Bach Mai Hospital, from 1/2015 to 12/2018. A total of 417 neonates born in the Department of Obstetrics, Bach Mai Hospital, and then admitted to the ICU of the Pediatrics Department (Bach Mai Hospital, between 1/2015 and 12/2018) were included in the study. They were divided into two groups: 1) the case group consisting of 139 neonates having postnatal respiratory failure; and 2) the control group consisting of 278 neonates hospitalized for other causes instead of respiratory failure.

Acute respiratory failure is defined as lung dysfunction which causes failure in balancing oxygen and carbon dioxide, leading to uncontrolled PaO_2 (partial pressure of oxygen), $PaCO_2$ (partial pressure of carbon dioxide), and pH in the lung[8]. Infants with the following clinical symptoms could be diagnosed with respiratory failure: 1) Rapid breathing with > 60 breaths/min or slow breathing with < 40 breaths/min; 2) Chest wall retractions or paradoxical movement of the chest wall; 3) Nasal flaring; 4) Long breathing or apnea; 5) Cyanosis when breathing; and 6) Apgar

Cite this article : Nam N T, Dem P V, Tam N T, Khac Hung D, Dung N T. **Preterm birth and low birth weight in neonates with postnatal respiratory failure at a tertiary hospital in Viet Nam**. *Biomed. Res. Ther.;* 7(9):4010-4015.

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score at the 1st and 5th minute after being born (total score: ≤ 3: severe asphyxia, 4–6 points: moderate asphyxia, ≥ 7: normal). Moreover, results of blood gas and pulmonary X-ray could be used as supplements[8], including: 1) $Pa0_2$ < 60mmHg, and/or $PaCO_2$ > 50mmHg and pH < 7.1–7.2; 2) Badly enlarged bilateral lungs, ground-glass opacity nodules, or stagnant air in a large bronchus, and even white lungs occurring if the disease was severe[9].

In this study, all newborns with respiratory failure were diagnosed by pediatricians with at least five years of experience in the newborn care unit at the Obstetrics and Gynecology Department of Bach Mai hospital. When they were admitted to the neonate ICU of the Department of Pediatrics, all of them had undergone cardiac ultrasound. They were also scanned for cardiac conditions during the treatment period by pediatric radiologists.

Data sources and measurements

Premature infants were defined as neonates who had gestational ages less than 37 weeks or less than 259 days. According to gestational age, infants could be divided into four groups: 1) Extremely preterm (24 to < 28 weeks); 2) Very preterm (28 to < 32 weeks); 3) Preterm infants (32 to < 37 weeks); and Full-term infants (37 – 42 weeks).

Infants with a birth weight below 2500 g were classified as low birth weight[3]. They could be categorized into: 1) Low weight (1,500 g to < 2,500 g); 2) Very low weight (1,000 g to < 1,500 g); and 3) Extremely low weight (< 1,000g).

Data about causes of gestational age and low birth weight, and whether infants received mechanical ventilation or not were also collected.

Statistical Analysis

We compared gestational age and birth weight between two study groups with and without respiratory distress. T-test was used to compare the means of birth weight and gestational age. Chi-squared and Fisher's exact tests were used to detect the differences between both groups. Odds ratio was calculated to examine the association between low birth weight and respiratory failure. Two-sided p-value < 0.05 was considered statistically significant.

Ethical approval

The Institutional Review Board of the Bach Mai Hospital approved the protocol of this study (Code 3534/QD-BM).

RESULTS

The mean gestational age of the case group was 34 weeks, which was lower than that of the control group (mean = 38 weeks) (p < 0.001). The mean weight in the case group was 2,057 g, which was lower than the control group (mean = 2,893 g) (p < 0.001). Hyaline membrane disease occurred on neonates with less than 32 weeks of gestational age. Asphyxia occurred in all ages, transient dyspnea predominantly occurred in full-term infants (37 – 42 weeks), and cardiovascular disease occurred in gestational age of greater than 32 weeks.

For neonates with respiratory failure, the rate of preterm infants accounted for 70.5%, of which 42.5% were born at 32 – 37 weeks of gestation. Preterm birth was associated with postnatal respiratory failure (p < 0.001).

The percentage of neonates with less than 37 weeks of gestation requiring mechanical ventilation for respiratory failure was 73.5%, of which neonates with less than 32 weeks of gestation accounted for 47.1%. Preterm birth was associated with postnatal respiratory failure requiring mechanical ventilation (p < 0.001).

The neonatal group having birth weight less than 2,500 g accounted for 65.5% in the respiratory failure group. Low birth weight was associated with a higher risk of postnatal respiratory failure (p < 0.001). The mean birth weight of the respiratory failure group was 2,056.9 ± 939.3 g, which was significantly lower than that of the control group (2,893.3 ± 608.6 g) (p < 0.001).

Of the 139 neonates with respiratory failure, 65.5% had low birth weight (< 2,500 g). Low birth weight was associated with postnatal respiratory failure (p < 0.001). The risk of respiratory failure in low birth weight infants (< 2,500 g) was 5.324 (OR = 5.324, 95% CI: 3.429 – 8.267) times higher than infants with normal birth weight.

DISCUSSION

Our study echoed results from the existing literature, confirming the associations between low birth weight, preterm birth and respiratory failure among neonates. In this study, we found a significant high rate of the above health problems in infants with respiratory failure condition. Our study suggested several clinical implications for designing appropriate management for infants with low birth weight and preterm birth in the context of a tertiary hospital in Vietnam.

In the current study, the rate of preterm birth in infants with respiratory failure was 70.5%, which was

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Table 1: Gestational age and causes of postnatal respiratory failure (n = 139)

Gestational age	< 28^{th} week (11 neonates)		28^{th} to < 32^{nd} week (28 neonates)		32^{nd} to < 37^{th} week (59 neonates)		37^{th} - 42^{nd} week (41 neonates)	
Causes	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Hyaline Membrane Disease (15 neonates)	7	63.6%	8	28.6%	0	0%	0	0%
Asphyxia (22 neonates)	3	27.3%	7	25%	7	11.9%	5	12.2%
Transient dyspnea (14 neonates)	0	0%	0	0%	2	3.4%	12	29.3%
Pneumonia (3 neonates)	0	0%	0	0%	1	1.7%	2	4.9%
Patent Ductus Arteriosus (22 neonates)	0	0%	0	0%	9	15.2%	13	31.7%
Pulmonary Arterial Hypertension (5 neonates)	0	0%	0	0%	1	1.7%	4	9.8%
Sepsis (4 neonates)	0	0%	1	3.6%	0	0%	3	7.3%
Brain hemorrhages (1 neonates)	0	0%	0	0%	1	1.7%	0	0%
Hypoglycemia (7 neonates)	0	0%	0	0%	7	11.9%	0	0%
Other congenital heart defects (1 neonates)	0	0%	0	0%	0	0%	1	2.4%
Other diseases + preterm birth (45 neonates)	1	9.1%	12	42.8%	31	52.5%	1	2.4%

Table 2: Distribution of gestational age

Gestational age	Gestational age (weeks)				Average gestational
Child patient	**< 28**	**28 to < 32**	**32 to < 37**	**37 - 42**	**Age (X ± SD)**
Respiratory failure (139 neonates)	11	28	59	41	34.02 ± 4.27
	7.9%	20.1%	42.5%	29.5%	
Non respiratory failure (278 neonates)	0	1	66	211	38.13 ± 2.09
	0%	0.4%	23.7%	75.9%	
p - value	< 0.001				< 0.001

Table 3: Relation of gestational age and risk of mechanical ventilation, results of treatment

Gestational age	Mechanical ventilation (68 neonates)		Non mechanical ventilation (71 neonates)	
	n	%	n	%
< 28^{th} week	11	16.2	0	0
28^{th} to < 32^{nd} week	21	30.9	7	9.9
32^{th} to < 37^{th} week	18	26.5	41	57.7
37^{nd} – 42^{nd} week	18	26.5	23	32.4
p - value		< 0.001		

Table 4: Respiratory and birth weight of children

Weight	Birth weight (g)					Average weight (X ± SD)
Group	< 1,000	1,000 to < 1,500	1,500 to < 2,500	2,500 to 3,500	> 3,500	
Respiratory failure (139 neonates)	18	24	49	39	9	2,056.9 ± 939.3
	13%	17.3%	35.2%	28%	6.5%	
Non respiratory failure (278 neonates)	0	3	70	165	40	2,893.3 ± 608.6
	0.0%	1.1%	25.2%	59.3%	14.4%	
p - value			< 0.001			< 0.001

Table 5: Relation of low birth weight and postnatal respiratory failure

Group	Respiratory failure (139 neonates)		Non respiratory failure (278 neonates)		p	OR (95%CI)
Weight	n	%	n	%		
< 2,500 g (164 neonates)	91	65.5	73	26.3	< 0.01	5.324 (3.429 - 8.267)
≥ 2,500g (253 neonates)	48	34.5	205	73.7		

significantly higher than that in the non-respiratory failure group. This rate in our study was higher than that of a previous study in Vietnam, which reported that only one-third of premature infants were admitted to the ICU due to respiratory failure[1]. According to Reuter *et al.* (2014), respiratory failure might account for up to 7% of full-term infants; among those admitted to the neonate ICU, the rate of respiratory failure was 15% in full-term infants and 29% in preterm infants[10]. Moreover, Reuter *et al.* found that neonates with less than 34 weeks of gestational age had a higher rate of respiratory failure[10]. Our results might be higher due to the fact that our patients were immediately admitted to the ICU after being born at the Department of Obstetrics of Bach Mai Hospital.

Low birth weight causes many postpartum diseases, especially respiratory failure. According to our results, the proportion of neonates weighing less than 2,500 g and suffering from respiratory failure was 65.5%, which was much higher than those without respiratory failure. Liu *et al.* conducted a study among 205 preterm infants with respiratory failure and also found similar results[11]. Thus, low birth weight was a risk factor in causing respiratory failure among preterm infants. This risk is able to be controlled when pregnancy and maternal disease were managed strictly.

Of note, our premature infants had higher rates of hyaline membrane disease, asphyxia, and hypoglycemia than those of full-term infants. Our results were similar to those from study by Donn *et al.*

(2006), which showed that hyaline membrane disease occurred predominantly in neonates < 32 weeks[3,12]. Anne Greenough *et al.* found that the rate of hyaline membrane disease was 50% among those with less than 30 weeks of gestational age and only 2% among infants with the gestation age from 35 to 36 weeks[12]. Jonathan *et al.* indicated that the rate of pulmonary arterial hypertension in neonates accounted for 5% — 10% of all congenital heart defect cases. In addition, there were about 80% of neonates with acute respiratory failure having pulmonary arterial hypertension; approximately 70% of those with less than 30 weeks of gestation age had patent ductus arteriosus[13].

The results of our study herein also showed that the rate of preterm infants requiring mechanical ventilation was 73.5% in the case group, which was higher than that of the control group (67.6%). Among infants with respiratory failure who had gestation age of less than 32 weeks, the rate of infants receiving mechanical ventilation was significantly higher than the rate of infants not requiring non-mechanical ventilation. Thus, it is necessary to manage pregnancy, maternal disease, and monitor risk factors of preterm birth. Also, there is a need for a collaborating mechanism between the Department of Obstetrics and Department of Pediatrics in neonatal resuscitation and care immediately after birth.

This study had some limitations. The study design limits the ability to conclude a causal relationship between preterm birth, low birth weight, respiratory failure, and their consequences. Also, only information on gestational age, birth weight, causes of respiratory failure, and whether or not the outcome was fatal were collected. Other factors, such as potential risks during pregnancy or track disease progression., were not considered. Besides, our study results are not representative because this study was conducted at only one tertiary hospital with small sample size. Therefore, it is not possible to extrapolate results for all premature, low birth weight infants with respiratory distress in Vietnam.

CONCLUSION

The rates of preterm birth and low birth weight among infants with respiratory failure in a tertiary hospital in Vietnam were significantly high. Causes of preterm birth and low birth weight are preventable and treatable if having an appropriate care and treatment plan.

ABBREVIATIONS

ICU: Intensive Care Unit

$PaCO_2$: Partial pressure of carbon dioxide

PaO_2: Partial pressure of oxygen

WHO: World Health Organization

ACKNOWLEDGMENTS

The authors are thankful to Department of Obstetrics and the ICU of the Pediatrics Department (Bach Mai Hospital) for providing the administrative support to do this study.

AUTHOR'S CONTRIBUTIONS

Nguyen Thanh Nam: Conceptualization, Formal analysis, Methodology, Visualization, Writing — original draft, Writing — review & editing. Pham Van Dem: Conceptualization, Investigation, Methodology, Project administration, Validation, Visualization, Writing — original draft, Writing — review & editing. Ngo Thi Tam: Formal analysis, Software, Writing — original draft, Writing — review & editing. Nguyen Tien Dung: Conceptualization, Supervision, Validation, Visualization, Writing — original draft, Writing — review & editing. All authors read and approved the final manuscript.

FUNDING

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

Data and materials used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted in accordance with the amended Declaration of Helsinki. The Institutional Review Board of the Bach Mai Hospital approved the study, and all participants provided written informed consent.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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