



EVALUATION OF EMONC (EMERGENCY OBSTETRIC AND NEONATAL CARE SERVICES IN BASRAH) FOR FIVE YEARS INTERVAL (2016-2020)

¹ALABRAHIM MAISAA, ²AL-IBRAHEEM FATIMAH

¹M.B.CH.B.F.I C.M.S/CM, University of Basrah/Basrah Public health department |Basrah|Iraq
drmaisaayousif@gmail.com

²MSc (Pharmacology), University of Basrah/ Basrah Specialized Hospital for Cardiac Diseases and Surgery, Basrah/Iraq
fatimaalibrahem@gmail.com

Article history:	Abstract:
<p>Received: June 1st 2022 Accepted: July 1st 2022 Published: August 6th 2022</p>	<p>Background Maternal mortality and severe maternal morbidity are critical health issues in Iraq, Maternal mortality ratio per 100000 live birth (34.2) and Neonatal mortality rate per 1000 live births(13.7) in a year 2020 in Iraq, a majority of pregnancy-related deaths are preventable, FANC, along with family planning, skilled delivery care and emergency obstetric care plays an important role in reducing maternal and neonatal mortality.</p> <p>Introduction Emergency Obstetric and Newborn Care (EmONC) are services that managing complications of childbirth and they are critical to saving the lives of mothers and newborn.</p> <p>Objective The objective of this study was to evaluate Emergency obstetric and neonatal care services in Basrah from (2016-2020) .</p> <p>Methodology The study is a descriptive retrospective record based study carried out in public health department in Basrah governorate during the period from the first of January to the 30th of October 2021, The study covered five years (2016-2020) inclusive.</p> <p>Result The rate of CEmONC facilities per 500,000 people(2.78)and the rate of BEmONC facilities per 500,000 people (1.14), total Caesarean delivery(23.9%) in a year 2016, (43.9%)in private hospitals and (26.1%) in Governmental hospital while in the year 2020, Caesarean delivery(29.9%), (48.7%) in Private hospitals and (31%) in Governmental hospital. the Percentage of births by skilled personnel (98%) in 2016and (98.1%) in 2020, Maternal mortality ratio per 100000 live birth (55.9) in 2016 and (54) in2020, Neonatal mortality rate per 1000 live births (18.4) in 2016 and (18.6) in2020.</p> <p>Conclusion 1- There are sufficient number of (CEmONC) and insufficient(BEmONC)facilities in Basrah. 2- High rate of births inside health facilities and by skilled personnel which reflect good utilization of EmONC facility. 3- the rate of caesarean delivery is higher than acceptable level (5-15%). 4- Maternal mortality ratio and neonatal mortality rate high which reflect low quality of emergency obstetric and neonatal care in Basrah governorate.</p>

Keywords: Emergency Obstetric and Newborn Care(EmONC), Evaluation , maternal mortality, neonatal mortality, cesarean delivery, skilled birth delivery.

INTRODUCTION

Emergency Obstetric and Newborn Care (EmONC) are services that managing complications of childbirth and

they are critical to saving the lives of mothers and newborn.^(1,2,3)

There are 2 levels of care : basic and comprehensive depending on presence or absence of specific life-



saving interventions EmONC Signal Functions⁽⁴⁾ the basic facility contain the following signal functions Parenteral antibiotics , Uterotonics (e.g. parenteral oxytocics & misoprostol) , Parenteral anticonvulsants , Manual removal of placenta , Removal of retained product (e.g. MVA or D&C), Assisted vaginal delivery (with vacuum extractor or forceps), Basic neonatal resuscitation (e.g., with bag and mask)^(5,6).

The Comprehensive facility contain All Basic signal functions plus Surgery (e.g., cesarean), Blood Transfusion⁽⁷⁾. A facility qualifies as functionally Basic EmONC if seven specific life-saving interventions or signal functions have been performed in the 3 months (newborn resuscitation has been added recently as the seventh signal function).^(8,9)

A facility qualifies as functionally Comprehensive EmONC if cesarean and blood transfusion services are provided in addition to the seven Basic services^(10,11).

EmONC Services In Iraq

Both levels of care are available in Iraq (basic & comprehensive).

Comprehensive :107 hospitals excluding KRG (General , maternity , maternity and child hospitals Teaching and non teaching hospitals).

Basic :136 PHCCs with labor rooms (80 functional) in remote and peripheral areas⁽¹²⁾.

EmONC Guidelines and Protocols

-WHO- Guidelines :Reviewed and adapted:

- Pregnancy, childbirth, postpartum and neonatal care guideline(IPCPN Guidelines)

-Managing Complications in Pregnancy and Childbirth; guide for doctors and midwives.

National protocols developed by Gyn/Obst. committee (PPH,HDP,PL ,PTL), Misoprostol).^(13,14,15)

Additional Protocols (infection control & prevention)-

Essential Drugs for EmONC

-Drug list for comprehensive care(hospitals) include all live saving drugs: (Anticonvulsant (Mg sulfate), Uterotonics & Misoprostol, Antibiotics, Corticosteroids).

-Drug list for basic services(PHCCs) does not include(Mg sulfate, misoprostol).^(16,17)

EmONC Services In Basrah

3063059 total population of Basrah

Both levels of care are available in Basrah (basic & comprehensive)

Comprehensive :17

hospitals(4central,6district,7private). -1

2-Basic : 6 PHCCs with labor rooms functional in remote and peripheral areas.⁽¹⁸⁾

Table[1]emergency obstetric care indicators description⁽¹⁹⁾

EmOC indicators	Description	Acceptable level
Availability of EmOC: BEmOC and CEmOC facilities	Ratio of EmOC facilities to the population	≥ 5 EmOC facilities per 500000 inhabitants ≥ 1 CEmOC facilities per 500000 inhabitants
Geographic distribution of EmOC facilities	Ratio of EmOC facilities at subnational level	As above
Proportion of all births performed in EmOC facilities	Proportion of all births in the population in EmOC facilities	Recommended level to be set locally
Met need for EmOC	Proportion of women with major direct obstetric complications treated in EmOC facilities	100%
Caesarean delivery as a proportion of all births	Proportion of all births in the population by caesarean delivery in EmOC facilities	5-15%
Direct obstetric case fatality rate	Proportion of women with major direct obstetric complications who die in EmOC facilities	Less than 1%
Intrapartum and very early neonatal death rate	Proportion of births that result in an intrapartum or very early neonatal death (<24 h) in EmOC facilities	To be determined
Proportion of maternal deaths with indirect causes	Percentage of all maternal deaths in EmOC facilities with indirect causes	None set



Table [2] Comprehensive hospitals in Basrah

Central hospitals	District hospitals	Private hospitals
Al Basrah for Maternity and children Teaching Hospital	ALQurna Public Hospital	Almoosawi Hospital
Al Basrah Teaching Hospital	AlZubair Public Hospital	Almuasat Hospital
Al Mwanee Teaching Hospital	ALMedainah Public Hospital	Alsaadi Hospital
Al Faihaa Teaching Hospital	Abu ALKhasseib Public Hospital	Alamirat Hospital
	Al Fao Public Hospital	Almawada Hospital
	Umqasar Public Hospital	Alshifa Hospital
		Ibn al-Baitar Hospital
Total/4	Total/6	Total/7

Table [3] Basic institutions in Basrah

PHCc that contain Labor room in Basrah
Shat AL-Arab
AL-Hartha
AL-Dair
AL-seebah
Khur –Alzubair
safwan
AL-huair
Total/7

AIMS

Evaluate the performance of Emergency obstetric and neonatal care services in Basrah for five years interval (2016-2020) by certain indicators for availability, utilization, and quality of emergency obstetric care in Basrah .

METHODOLOGY

Study area

The research was performed in the governorate of Basrah , which is an Iraqi governorate located in the far south of Iraq. It is bordered by Kuwait and Saudi Arabia to the south, and Iran to the east. It shares local borders with the governorates of Dhi Qar and Maysan in the north, and Al Muthanna Governorate in the west, and the governorate center is the city of Basrah. It has a total area of 181 km², about 450 kilometers south of Baghdad's capital. It has a population of 3063059 , 719653 (23.4 percent) females in reproductive age and 94711 (3.09 percent) pregnant women in 2020.

The delivery services are primarily provided by the public sector, where the governorate has a wide network of health facilities. There are 10 public hospitals (Al Basrah for Maternity and children Teaching Hospital, Al Basrah Teaching Hospital, Al Faihaa Teaching Hospital, Al Mwanee Teaching Hospital in the city while Abu AL-Khasseib Public Hospital, AL-Zubair Public

Hospital, AL-Qurna Public Hospital, AL-Medainah Public Hospital, Al Fao Public Hospital, Um-qasar Public Hospital in periphery of Basrah,and 7 private hospitals(Almoosawi Hospital, Almuasat Hospital, AlSaadi Hospital, Alamirat Hospital, Almawada Hospital, Alshifa Hospital , Ibn al-Baitar Hospital) and 7 primary health care centers with delivery rooms (Shat AL-Arab in Shat AL-Arab health district, AL-Hartha in AL-Hartha health district, AL-Dair in AL-Dair health district, ALseebah in Abu AL- Khasseib health district, Khur – Alzubair and safwan in AL-Zubair health district, and ALhuair in AL-Medainah health district). Many of these health facilities, which provide delivery services in both urban and rural areas, are located across the governorate.

Population and Illegibility Criteria

All governmental hospitals ,private hospitals and health centers expected to give EmONC services in the district were included in the study.

Sample Size Determination

World Health Organization (WHO) recommends the use of all health facilities in the area if they are less than 100 in number for the evaluation of the EmONC performance .Therefore, all health facilities (seven health centers and 17 hospitals) expected to provide EmONC services were included.

Study subject



The study was performed by two researcher and lasted from the first of January to the 30th of October 2021, The study covered five years interval (2016-2020) inclusive.

Study design

The study is a descriptive retrospective record based study carried out

in public health department in Basrah governorate during the period from the first of January to the 30th of October 2021, The study covered five years (2016-2020) inclusive. All the(normal and cesarean delivery, skilled and unskilled delivery, maternal deaths, neonatal deaths, delivery inside and outside health facilities) were included in the study. Only verified and registered numbers of cases in these years were used.

Sources of data

Statistical records from annual statistical report have been used for compilation of the data. statistical report It is an official statistical document issued by the Department of Planning and Resource Development, Information sources depend on statistical forms and computer programs approved in all health institutions(hospitals, health centers), Where it is collected, consolidated and transferred through the statistical pyramid to the Ministry's center in addition to benefiting from the results of field surveys. Statistical indicators are calculated according to the methods approved by the World Health Organization (Global reference list of 100 Core Health Indicator 2015).

Statistical analysis

Using SPSS statistical tools for Windows version 22 and Microsoft Excel 2013, After categorizing and defining variables, descriptive statistical tests were carried out for availability, utilization and quality of EmONC. each descriptive statistic was summarized using frequency, percentage, and tables for categorical variables, Calculations for the number of EmONC facilities per 500,000 people, cesarean delivery rate, maternal mortality ratio and neonatal mortality rate done as follows:

(1)Rate of CEmONC facilities per 500,000 people = existing CEmONC/total population × 500,000.

(2)Rate of BEmONC facilities per 500,000 people = Existing BEmONC/total population × 500,000.

(3) cesarean delivery rate =Total number of resident cesarean deliveries / Total number of deliveries in women) × 100.

(4) skilled birth rate = Total number of births inside governmental and private health facilities / total number of births in Basrah for each year ×100 live births.

(5) maternal mortality ratio = number of maternal deaths/ total live births ×100,000.

(6) neonatal mortality rate =total number of neonate deaths (0-28) / total live births×1000.

Operational Definitions:

Availability of EmONC Services

These are the BEmONC and CEmONC services providing lifesaving obstetric procedures, including surgery. The minimum acceptable levels are as follows: there should be one facility providing fully functioning CEmONC, and five facilities providing fully functioning BEmONC for every 500,000 people.

Quality EmONC services

Are the degree to which the actual performance or achievement of the health service system corresponds to set standards.

RESULTS

Rate of CEmONC facilities per 500,000 people(2.78) , Rate of BEmONC facilities per 500,000 people (1.14), Births percentage inside health facilities

(88.3%) in a year 2016 ,(88.7%) in 2017,(90.5%) in 2018,(92.1%) in 2019 and (90.2%) in 2020 while births outside health facilities (11.7%) in a year 2016 ,(11.3%) in 2017, (9.5%) in 2018,(7.9%) in2019 and (9.8%) in a year 2020. From the total births inside health facilities the Births in Primary health care centers (1.4%) in a year 2016,(1.2%) in 2017,(1.6%) in 2018 and 2019,(3.1%) in2020, while the Births in Private hospital (5.3%) in 2016, (5.6%) in 2017,(6.7%) in 2018,(7.5%) in 2019 and (11.9%) in 2020, In addition to Births in Governmental hospital which is (93.3%) in a year 2016, (93.2%) in 2017, (91.7%) in 2018,(90.9%) in 2019 and (84.9%) in 2020.

The percentage of Total births according to birth outcome and births by skilled personnel (1%) Stillbirths and (99%) live births from the year 2016 to 2020 alternately, the Percentage of births by skilled personnel (98%) in 2016,(96.8%) in 2017,(97.7%) in 2018,(98.3%)in 2019 and (98.1%) in 2020, while the Percentage of births by unskilled personnel (2%) in 2016,(3.2%) in 2017,(2.3%) in 2018,(1.7%) in 2019 and (1.9%) in 2020.

Total births according birth type, Caesarean delivery(23.9%) in a year 2016, (43.9%)in private hospitals and(26.1%) in Governmental hospital, in the year 2017 ,(26 %) Caesarean delivery, (45.6%) in private and (28.3%) in Governmental hospital, in 2018, (27.3%) Caesarean Delivery,(43.5%) private and (28.1%) Governmental hospital, in 2019, (28.1%) Caesarean Delivery, 46.3%) private and (29.2%) Governmental hospital ,)

while in 2020, Caesarean delivery(29.9%), (48.7%) in Private hospitals and (31%) in Governmental hospital.

Maternal mortality ratio per 100000 live birth as follows (55.9) in 2016,(26.9) in 2017,(38.5) in 2018,(39.3) in 2019 and(54) in 2020 while Neonatal mortality rate per1000 live births as follows (18.4) in 2016,(16.9) in 2017,(17.2) in 2018, (17.7) in 2019 and (18.6) in 2020.



Table [4] Total births according to place of birth

year	Births inside health facilities N%	Births outside health facilities N%	Total
2016	89521(88.3%)	(11.7%) 101365	(100%) 190886
2017	(88.7%)89912	(11.3%) 11405	(100%)101317
2018	(90.5%)87920	9228(9.5%)	(100%) 97148
2019	(92.1%)87557	(7.9%) 7493	(100%)95050
2020	(90.2%) 84375	(9.8%) 9196	(100%)93571

Table[5] Total births inside health facilities

year	Total births inside health facilities N%	Births in Primary health care centers N(%)	Births in Private hospital N%	Births in Governmental hospital N%
2016	(%100) 89521	(1.4%)1238	(5.3%)4727	(93.3%) 83556
2017	(100%)89912	(1.2%)1063	(5.6%)5054	(93.2%)83795
2018	(100%)87920	(1.6%)1482	(6.7%) 5850	(91.7%) (80588)
2019	(%100)87557	(1.6%)1466	(7.5%)6522	(90.9%)79569
2020	(100%)84375	(3.1%)2633	(11.9%)10070	(84.9%)71672

Table [6] Total births according to birth outcome and births by skilled personnel

year	Total births %N	Stillbirths %N	Live births %N	Percentage of births by unskilled personnel	Percentage of births by skilled personnel
2016	101365(%100)	1108(%11.)	100257(98.9%)	%2	%98
2017	101317(100%)	1004(1%)	100313(99%)	%3.2	%96.8
2018	97148(100%)	923(1%)	96225(99%)	%2.3	%97.7
2019	95050(100%)	913(1%)	94137(99%)	%1.7	%98.3
2020	93571(100%)	950(1%)	92621(99%)	%1.9	%98.1

Total births according birth type Table[7]

year	Total number of deliveries	Caesarean Delivery %N	Normal Delivery %N	Private hospitals		Governmental hospital	
				Caesaria n delivery percenta ge	Normal delivery percenta ge	Caesaria n delivery percenta ge	Normal delivery percentag e
2016	101365(%100)	24234(23.9%)	77131 ((76.1%)	%43.9	%56.1	%26.1	%73.9
2017	101317(100%)	26332 (%26 (74985(74%)	%45.6	%54.4	%28.3	%71.7
2018	97148(100%)	25593(27.3%)	71555(73.7%)	%43.5	%56.5	%28.1	%71.9
2019	95050(100%)	26696 (28.1%)	68354 (71.9%)	%46.3	%53.7	%29.2	%70.8
2020	93571(100%)	27960(29.9%)	65611(70.1%)	%48.7	%51.3	%31.0	%69.0



Table[8] Number of maternal mortality and its ratio per 100000 live births and Neonatal mortality rate per1000 live births

year	Maternal mortality ratio per 100000 live birth	Number of live births	Number of maternal mortality	Neonatal mortality rate per 1000 live births
2016	55.9	100257	56	18.4
2017	26.9	100313	27	16.9
2018	38.5	96225	37	17.2
2019	39.3	94137	37	17.7
2020	54.0	92621	50	18.6

DISCUSSION

As we can see in this study rate of CEmONC facilities per 500,000 people(2.61) which is within acceptable level (1)and the rate of BEmONC facilities per 500,000 people (1.14) which is lower than minimum acceptable level(5), the percentage of Births inside health facilities Increase from 88.3% in a year 2016 to 90.2% in2020 and the percentage of births by skilled personnel Almost constant over all years (98%) which is a good indicator for utilization of EmONC services in Basrah governorate , Cesarean deliveries higher than the acceptable rate(5-15%) and have increased significantly from 23.9% in 2016 to 29.9% in 2020, the rate of increase in caesarean deliveries is more significant in private hospitals 43.9% in 2016 and increase to 48.7% in 2020, This does not cancel out that its percentage is high in Governmental hospital which increase from 26.1% in2016 to 31% in 2020,this high caesarean deliveries rate effect the utilization of EmONC services in Basrah governorate, Despite the high rate of births inside the health facility and by skilled hands, a high percentage of these births are caesarean deliveries.

Maternal mortality Decrease from (55.9) in 2016 to (26.9) in 2017 and it gradually rose again in 2018 to (38.8) and (39.3) in 2019 Until the ratio reached (54) per 100000 live birth in 2020 The reason for the increase in 2020 may be due to 9 deaths as a result of COVID19 In addition to the impact of the pandemic on quality of care.

Neonatal mortality decrease from (18.4) in 2016 to (16.9) in 2017 and The percentage gradually increased from 2018 to 2020 to reach (18.6)per 1000 live birth Which represents a high percentage and far from the sustainable development goals, which aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births, Once again, this increase may be due to the

impact of the pandemic and the low quality of care during pandemic in Basrah.

CONCLUSION

- 1- There are sufficient number of (CEmONC) and insufficient(BEmONC)facilities in Basrah.
- 2- High rate of births inside health facilities and by skilled personnel which reflect good utilization of EmONC facility.
- 3- the rate of caesarean delivery is higher than acceptable level (5-15%).
- 4- Maternal mortality ratio and neonatal mortality rate high which reflect low quality of emergency obstetric and neonatal care in Basrah governorate.

ACKNOWLEDGMENT

I would like to express my thanks to all Directors of hospitals and health centers for their cooperation and patience.

Conflict of interest: Nil

Source of funding: Nil

Author's contribution: ALABRAHIM MAISAA conceived and designed the study. ALABRAHIM MAISAA and AL-IBRAHEEM FATIMAH performed data collection. ALABRAHIM MAISAA interpreted and analyzed the data. ALABRAHIM Maisaa and AL-IBRAHEEM FATIMAH wrote and revised the manuscript. both authors read and approved the final manuscript.

ABBREVIATION

- EmONC (Emergency Obstetric and Newborn Care)-
- BEmONC(basic Emergency Obstetric and Newborn Care)-
- CEmONC(comprehensive Emergency Obstetric and Newborn Care)-
- D&C(Dilation and curettage) -
- MVA (Manual Vacuum Aspiration)-



(Kurdistan Regional Government *KRG*–
WHO (world health organization)-
PPH (post partum hemorrhage)-
HDP (Hypertensive Disorders in Pregnancy)-
PL(prolong labor)-
PTL(pre term labor)-
primary health care centers))PHCCs –
FANC(focused antenatal care) -

REFERENCE

1. Ayalew Tiruneh G, Melkamu Asaye M, Solomon AA, Tiruneh Arega D. Delays during emergency obstetric care and their determinants among mothers who gave birth in South Gondar zone hospitals, Ethiopia. A cross-sectional study design. *Glob Health Action*. 2021 Jan 1;14(1):1953242. doi: 10.1080/16549716.2021.1953242. PMID: 34328059; PMCID: PMC8330726.
2. AlMashhadani HA, Saleh KA. Electrochemical Deposition of Hydroxyapatite Co-Substituted By Sr/Mg Coating on Ti-6Al-4V ELI Dental Alloy Post-MAO as Anti-Corrosion. *Iraqi Journal of Science*. 2020 Nov 28;2751-61.
3. Limam M, Hachani F, Ghardallou ME, Bachraoui M, Mellouli M, Mtiraoui A, Khairi H, Ajmi T, Zedini C. Availability, utilization and quality of emergency obstetric care services in Sousse, Tunisia. *Pan Afr Med J*. 2021 Mar 16;38:272. doi: 10.11604/pamj.2021.38.272.17758. PMID: 34122699; PMCID: PMC8180000.
4. Wilunda C, Oyerinde K, Putoto G, Lochoro P, Dall'Oglio G, Manenti F, Segafredo G, Atzori A, Criel B, Panza A, Quaglio G. Availability, utilisation and quality of maternal and neonatal health care services in Karamoja region, Uganda: a health facility-based survey. *Reprod Health*. 2015 Apr 8;12:30. doi: 10.1186/s12978-015-0018-7. PMID: 25884616; PMCID: PMC4403713.
5. Kabo I, Orobato N, Abdulkarim M, Otolorin E, Akomolafe T, Abegunde D, Williams E, Sadauki H. Strengthening and monitoring health system's capacity to improve availability, utilization and quality of emergency obstetric care in northern Nigeria. *PLoS One*. 2019 Feb 6;14(2):e0211858. doi: 10.1371/journal.pone.0211858. PMID: 30726275; PMCID: PMC6364938.
6. Ameh CA, Bishop S, Kongnyuy E, Grady K, Van den Broek N. Challenges to the provision of emergency obstetric care in Iraq. *Matern Child Health J*. 2011 Jan;15(1):4-11. doi: 10.1007/s10995-009-0545-3. PMID: 19946792.
7. Al-Mashhadani HA, Saleh KA. Electro-polymerization of poly Eugenol on Ti and Ti alloy dental implant treatment by micro arc oxidation using as Anti-corrosion and Anti-microbial. *Research Journal of Pharmacy and Technology*. 2020;13(10):4687-96.
8. Relyea B, Wringe A, Afaneh O, et al. Stakeholders' Perspectives on the Challenges of Emergency Obstetric Referrals and the Feasibility and Acceptability of an mHealth Intervention in Northern Iraq. *Front Glob Womens Health*. 2021;2:662256. Published 2021 May 26. doi:10.3389/fgwh.2021.662256.
9. Islam MT, Hossain MM, Islam MA, Haque YA. Improvement of coverage and utilization of EmOC services in southwestern Bangladesh. *Int J Gynaecol Obstet*. 2005 Dec;91(3):298-305; discussion 283-4. doi: 10.1016/j.ijgo.2005.06.029. Epub 2005 Oct 14. PMID: 16226760.
10. Ministry of Health (Iraq). *Iraq Annual Statistical Report*.
11. Pearson L, Shoo R. Availability and use of emergency obstetric services: Kenya, Rwanda, Southern Sudan, and Uganda. *Int J Gynaecol Obstet*. 2005 Feb;88(2):208-15. doi: 10.1016/j.ijgo.2004.09.027. Epub 2005 Jan 7. PMID: 15694109.
12. Leigh B, Mwale TG, Lazaro D, Lunguzi J. Emergency obstetric care: how do we stand in Malawi? *Int J Gynaecol Obstet*. 2008 Apr;101(1):107-11. doi: 10.1016/j.ijgo.2008.01.012. Epub 2008 Mar 4. PMID: 18291400.
13. Kongnyuy EJ, Leigh B, van den Broek N. Effect of audit and feedback on the availability, utilisation and quality of emergency obstetric care in three districts in Malawi. *Women Birth*. 2008 Dec;21(4):149-55. doi: 10.1016/j.wombi.2008.08.002. Epub 2008 Oct 7. PMID: 18842471.
14. Biswas AB, Das DK, Misra R, Roy RN, Ghosh D, Mitra K. Availability and use of emergency obstetric care services in four districts of West Bengal, India. *J Health Popul Nutr*. 2005 Sep;23(3):266-74. PMID: 16262024.
15. Kadhim MM, AlMashhadani HA, Hashim RD, Khadom AA, Salih KA, Salman AW. Effect of Sr/Mg co-substitution on corrosion resistance properties of hydroxyapatite coated on Ti-6Al-



- 4V dental alloys. *Journal of Physics and Chemistry of Solids*. 2022 Feb 1;161:110450.
16. Singh S, Doyle P, Campbell OM, Mathew M, Murthy GV. Referrals between Public Sector Health Institutions for Women with Obstetric High Risk, Complications, or Emergencies in India - A Systematic Review. *PLoS One*. 2016 Aug 3;11(8):e0159793. doi: 10.1371/journal.pone.0159793. PMID: 27486745; PMCID: PMC4972360.
17. Ntambue AM, Malonga FK, Cowgill KD, Dramaix-Wilmet M, Donnen P. Emergency obstetric and neonatal care availability, use, and quality: a cross-sectional study in the city of Lubumbashi, Democratic Republic of the Congo, 2011. *BMC Pregnancy Childbirth*. 2017 Jan 19;17(1):40. doi: 10.1186/s12884-017-1224-9. PMID: 28103822; PMCID: PMC5244553.
18. Acharya K, Subedi RK, Dahal S, Karkee R. Basic emergency obstetric and newborn care service availability and readiness in Nepal: Analysis of the 2015 Nepal Health Facility Survey. *PLoS One*. 2021 Jul 21;16(7):e0254561. doi: 10.1371/journal.pone.0254561. PMID: 34288943; PMCID: PMC8294533.
19. Charles A. Ameh, Nynke van den Broek, Making It Happen: Training health-care providers in emergency obstetric and newborn care, *Best Practice & Research Clinical Obstetrics & Gynaecology*, Volume 29, Issue 8, 2015, Pages 1077-1091, ISSN 1521-6934, <https://doi.org/10.1016/j.bpobgyn.2015.03.019>.
20. Gopalan, S.S., Das, A. & Howard, N. Maternal and neonatal service usage and determinants in fragile and conflict-affected situations: a systematic review of Asia and the Middle-East. *BMC Women's Health* 17, 20 (2017). <https://doi.org/10.1186/s12905-017-0379-x>.
21. A. Defar, Baseline Evaluation of Maternal and Newborn Health Care Services in 25 Selected Woredas, Federal Minster of Health (FMoH) Health System Research Directorate, Ethiopian Health and Nutrition Research Institute (EHNRI), Addis Ababa, Ethiopia, 2013.
22. Limam, M., Hachani, F., Ghardallou, M. E., Bachraoui, M., Mellouli, M., Mtiraoui, A., Khairi, H., Ajmi, T., & Zedini, C. (2021). Availability, utilization and quality of emergency obstetric care services in Sousse, Tunisia. *The Pan African medical journal*, 38, 272.

<https://doi.org/10.11604/pamj.2021.38.272.17758>.