

Barriers to the Implementation of Continuous Positive Airway Pressure (CPAP) Ventilation in Neonates at Birthplace in Tertiary Care Teaching Hospitals

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ABSTRACT

Objective: To explore different barriers to the implementation of continuous positive airway pressure ventilation in neonates at the birthplace.

Study Design: Mixed method study.

Place and Duration of Study: Combined Military Hospital and Pak-Emirates Military Hospital Rawalpindi Pakistan, from Jan to Jun 2021.

Methodology: Health care professionals involved in neonatal care at these two hospitals were included. The sample size was predetermined (60 in total). Participants' written response was obtained on an open-ended self-administered questionnaire distributed in person. All enrolled participants responded. Thematic analysis of data was carried out.

Results: The participants were predominantly female (66.66%), aged 20-30 (66.66%). Eight (13.33%) had received CPAP training. The majority (83.33%) think that CPAP is useful, but only 10 (33.33%) have CPAP experience at the delivery suite. The first theme category was "Health professional related". Participants reported lack of awareness, motivation and training, understaffing, communication gap, responsibility conflict and rapid turnover of health professionals as a barricade. The second theme category was "organization/system related". Nonexistence of CPAP written guidelines, Obstetrics/Gynaecology health professionals' unawareness about CPAP, CPAP implementation inferiority/ subservience/ subordination and multi-discipline hierarchy were deterrents. The third emerged theme category was "logistics/resources". Shortage, failed continuous equipment supply, and poor infrastructure is major hurdles.

Conclusion: This study has identified weak areas/glitches on which efforts should be focused and suggested recommendations to overcome hurdles and implement CPAP use at birthplaces.

Keywords: Barriers, Continuous Positive Airway Pressure (CPAP), Delivery place, Implementation, Neonate, Ventilation.

How to Cite This Article: Hussain S, Hussain M, Ullah I, Shah HUAS. Barriers to the Implementation of Continuous Positive Airway Pressure (CPAP) Ventilation in Neonates at Birthplace in Tertiary Care Teaching Hospitals. *Pak Armed Forces Med J* 2022; 72(3): 1114-1120.

DOI: <https://doi.org/10.51253/pafmj.v72i3.7328>

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INTRODUCTION

Gregory *et al*, introduced the first neonatal CPAP system in 1971.¹ Since then, continuous positive airway pressure in neonates has undergone tremendous improvements, and its use has saved millions of neonates from mortality and morbidity.

The normal transition from the fluid-filled non-breathing foetus lung to aerated breathing newborn lung involves lung expansion and the establishment of functional residual capacity. CPAP increases intra-alveolar pressure and functional residual capacity that helps establish adequate ventilation-perfusion in spontaneously breathing newborns.² CPAP system has attained popularity among neonatal Health Care Professionals (HCP) due to its simplicity and the least adverse effect effects, especially in low and middle-income countries. During the golden minute and

golden hour of life in neonates, CPAP is one of the standard recommended therapies to ameliorate neonatal morbidity and mortality, especially among premature babies.³ A Cochrane review done in 2015 has shown that early CPAP reduces the overall mortality.⁴ It is recommended that preterm neonates needing ventilator support receive CPAP from the very first breath.⁵ In this era of non-invasive neonatal ventilation, a paradigm shift has occurred in neonatal respiratory support, and CPAP is considered an evidence-based first choice for initial treatment of Respiratory Distress Syndrome. Recent studies have stressed the importance of using CPAP in preterm infants in the delivery room.⁶ Early application of CPAP in delivery places can significantly reduce delivery room intubations, total duration of respiratory support, need for invasive mechanical ventilation and postnatal use of steroids.^{7,8} Desai *et al*, reported that delivery room CPAP reduced the need for mechanical ventilation from 86-30%.⁹

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Received: 29 Aug 2021; revision received: 01 Mar 2022; accepted: 04 Mar 2022

The rationale for conducting this study was that Pakistan has the highest neonatal mortality rate (42/1000 live births) in the World. Nearly three-quarters of global neonatal deaths are preventable and manageable by proven, cost-effective interventions.¹⁰ CPAP use at birthplace is one of the interventions universally recommended for respiratory support required in preterm babies at the delivery place. CPAP use at the time of birth can reduce mortality, morbidity and the need for mechanical ventilation.

We did a gap analysis to identify the gap in the optimal management of neonates in the delivery room in our setups and found that maximum use of CPAP at the delivery place is lacking. Therefore, before implementing CPAP at the delivery place, we planned to explore the perception of HCP about CPAP's minimal use, reasons for least use and barriers to its implementation at birthplaces.

METHODOLOGY

This was a mixed-method study of Neonatal fellows, Paediatric residents and nurses involved in providing neonatal care at these two hospitals. This study was conducted from January to June 2021. Ethical approval and permission to conduct the study were endorsed by the Ethical Review Committee of CMH Rawalpindi (vide letter no 184/07/21).

The target participants for this study were Neonatal fellows, Paediatric residents and Nurses directly involved in neonatal care services in neonatal units of both hospitals. The study sample was recruited by a non-random, consecutive purposive sampling technique. The sample size was 60, including "10 nurses working in neonatal units, 4 Neonatal fellows undergoing fellowship training in neonatology and 40 Paediatric residents undergoing paediatric residency training".

Inclusion Criteria: All the nurses, paediatric residents and Neonatal fellows involved in neonatal care were included in the study.

Exclusion Criteria: House officers, Paediatricians, Neonatologists and other consultants involved in neonatal care were excluded from the study.

Objectives of research, voluntary participation and confidentiality were explained to participants. Written consent for participation was obtained. All enrolled participants consented and participated in the study. Confidentiality was assured by using numbers instead of names while collecting data. The sampling was non-random but consecutive, purposive and not

intended to generate generalizable nationally representative results of participants or health facilities. Instead, we aimed to collect and synthesise the perception and opinion of health care professionals directly involved in neonatal care about implementing CPAP use in delivery rooms. Variation in neonatal care experience, years of neonatal and paediatric residency and qualifications were sources of diversity.

An open-ended self-administered questionnaire was developed by researchers in consultation with other Neonatologists, medical educationists, Obstetricians and Anesthesiologists. The questionnaire was prepared in English and was piloted (n=10) by asking questions to complete the questionnaire and give feedback. We used this feedback to assess face validity and technical compatibility and refine the wording of the questions. We collected data on participants' background (age, gender, position, CPAP use experience, CPAP workshop attendance). Participants were asked to answer questions regarding barriers to implementing CPAP use at the delivery place in our setups. Their suggestions on improving CPAP use at delivery places in our setups were also sought. It was mandatory to answer all items of the questionnaire.

Paper-and-pencil self-administered questionnaire was distributed in person in both hospitals. All enrolled participants (n=60) responded, and every participant answered all questionnaire items.

Descriptive statistics were calculated for participants' characteristics/demographic data. The qualitative data were thematically analysed by compiling, disassembling, reassembling and interpreting. Each response was carefully read to develop analytic codes. The selective codes were categorized, and themes were developed. The data were independently analysed by authors and experts 40 (66.66%). Medical educationist and then corroborated to ensure analytical triangulation. During the data analysis, highlighted quotations were chosen.

RESULTS

The participants (sixty) were predominantly females (40, 66.66%) and 20-30 years old. Only 8 (13.33%) participants had received formal training in CPAP, but the majority (40, 66.66%), knew the basic principles of the CPAP mechanism. Among participants, a major chunk (50, 83.33%) think that CPAP is useful, and merely (10, 33.33%) have experience of CPAP use in delivery suite (Table-I).

Table-I: Participant Characteristics.

Characteristics	n (%)
Age	
20-30 Years	40 (66.66)
31-40 Years	10 (16.66)
41-50 Years	10 (16.66)
Gender	
Male	20 (33.33)
Female	40 (66.66)
Position	
Nurse	12 (20)
Postgraduate Resident	44 (73.33)
Neonatal Fellow	4 (6.66)
Any training obtained related to CPAP	
Yes	8 (13.33)
No	52 (86.66)
Do you know basic principles of CPAP?	
Yes	40 (66.66)
No	20 (33.33)
Do you know how to set CPAP machine and apply it to neonate	
Yes	45 (75)
No	15 (25)
Have you ever used CPAP in neonatal unit?	
Yes	55 (91.66)
No	05 (8.33)
Have you ever used CPAP in delivery suite	
Yes	10 (16.66)
No	50 (83.33)
What different types of CPAP machine have you used in neonatal unit	
Ventilator CPAP	40 (66.66)
Bubble CPAP	55 (91.66)
Local made CPAP	20 (33.33)
What different types of CPAP machine have you used in delivery suite?	
Ventilator CPAP	-
Bubble CPAP	-
Local made CPAP	10(20)
What's your opinion about CPAP usefulness at delivery suite?	
Useful	50 (83.33)
Not useful	5 (8.33)
Do not know	5 (8.33)

Three theme categories, i.e. Health professional related, Organization/System-related and logistic/resources related, were identified (Table-II). The suggestions purposed by health care professionals to improve implementation of Continuous Positive Airway Pressure (CPAP) were described in the Table-III.

Theme-1: Health care professional related:

Participants reported no CPAP formal training of HCP in the neonatal/paediatric department. In addition, significant understaffing and rapid turnover

of health professionals in neonatal units hinders the continuity of some initiative like CPAP use. , Major obstacles to delivery suite CPAP implementation are lack of awareness of the advantages of CPAP use immediately after birth, communication gap among neonatal and Obstetric residents at the time of delivery and CPAP use responsibility conflict at delivery suite.

Theme-2: Organization/system related:

The study group Identified that there are no written guidelines for the use of CPAP at the delivery suite, Gynaecology/Obstetrics residents/nurse/consultants are unaware of the benefits of the use of CPAP in preterm at the delivery place, and CPAP implementation carries the least priority in goal list of Neonatal medicine and Gynaecology/Obstetrics departments due to other prevailing issues like sepsis and perinatal asphyxia. The same applies to hospital administration regarding goal priorities. The participants believed that different disciplines have different views about CPAP use in the delivery room, as there is a lack of standard protocols and context-specific guidelines. The hierarchy between doctors and nurses also hinders CPAP implementation.

Theme-3: Logistics and resources related:

Major issues identified are lack of equipment and sustained supplies, poor infrastructure, insufficient human resources and time constraints.

DISCUSSION

We report a scarcity of awareness and knowledge about the benefits of delivery room CPAP (DR-CPAP) use among HCP. Many do not think CPAP is necessary for the delivery suite. They need counselling and knowledge sharing by senior clinicians. Similar barriers have also been reported by Atreya *et al*, in their study.¹²

Sufficient and adequate training before implementing any skill/ procedure is mandatory. The success of delivery room CPAP as non-invasive ventilation in preterm babies is directly related to the training and experience of health care professionals.¹³ Dearth of training nurses and residents about how to install and operate CPAP is another reported major barricade in implementation of CPAP in our study.

This finding is congruous with other studies.¹⁴ To be more confident and independent in the use of a CPAP machine, HCPs need more training in the form of workshops and hands-on training. Our finding of inadequate training of HCP is analogous to other studies reported in the literature.^{15,16}

Continuous Positive Airway Pressure

Table-II: Barriers towards implementation of Continuous Positive Airway Pressure (CPAP) use at delivery place.

Health care Professional Related	Training	"Knowledge and expertise to operate CPAP machine is deficient-(Female 33 years)" ... "I do not even know the basic principles related to CPAP working because there is no formal training of CPAP use in our department-(Female 28 Years)" "We have been trained in CPAP use in neonatal intensive care unit (NICU) and not delivery place (Female ,nurse, 32 years)" "
	Under Staffing	" It's difficult to manage alone a baby on CPAP in delivery room , second person should be available for help- (Male, resident, 32 years) "
	Awareness level	'Awareness regarding benefits of CPAP use at delivery place is lacking- (Male, neonatal fellow, 36 years)" "I think we should immediately shift baby to nicu for CPAP application as we are more comfortable to use CPAP in nicu (Female, nurse, 34 years)" "
	Lack of motivation	" Baby may deteriorate on CPAP during transport from delivery room to NICU and it's not good to apply CPAP in labour room (Female, resident, 31 years) "
	Communication gap	Obs/Gynae resident usually do not inform us in advance about a preterm delivery. we don't have time to assemble CPAP at delivery place (Male, resident, 32 years)" "
	Rapid turn over	" After every three month we have to rotate at new ward that makes difficult for new residents to adjust- (male, resident, 30 years) " " We have to move on compulsory rotation duty due to our training course at AFGMI that makes difficult for us to involve in more depth (Female, nurse, 27 years)" "
	Responsibility/conflict	"There is doubt about CPAP operational responsibility at delivery suite (Female, nurse, 36 years)" "It's not my responsibility to make CPAP available at delivery suite. I think it should be responsibility of Gynae/Obs people (Male, resident 30 years) " " CPAP use is responsibility of doctors and not nurses (Female, nurse, 42 years)" "
Organisation	Written guidelines	"There are no written guidelines issued by hospital or Neonatology/ Gynae department for use of CPAP at delivery place after birth. That's why we are not using CPAP in delivery place (Female, resident 30 years)" "I think first we should develop SOP for CPAP use , circulate among different departments and then implement (Male, neonatal fellow, 37)" "
	Gynae/ Obs HCP unawareness	" Gynae/ orbs people absolutely know nothing about cpap use at delivery suite- We should train them and tell them benefits of CPAP (Female, nurse, 39 years) "
	Goal priority	Neonatal care at delivery place is not priority among goals of neonatology and Gynae /Obs department due to other issues like sepsis and asphyxia (Female ,resident, 31 years)" - " Neonatal care projects are not in priority list of hospital administration (Male 37 years)" "
	Departmental Hierarchy	"Paeds resident is the easiest target for complaint if anything go wrong with baby after birth (Male ,resident, 29 years)" " Among Paeds, Gynae and Anaesthesia dept each teach neonatal care in their own way. I think there should be combined effort supervised by Neonatologist (Male, resident,30 years)" "
Resources/ Logistics	Insufficient human resource	"I have to resuscitate new-born alone and no one else is available for help to operate cpap in delivery room (Female ,resident, 27 years)" "
	Poor Infra structure	"It's difficult to carry CPAP machine from NICU to delivery room in emergency situation (Female, resident, 28 years)" "We are already over committed and do not find time to carry CPAP machine to delivery place (Female ,resident, 29 years)" "
	Lack of equipment	"Functional and latest CPAP machine should be available in delivery room. At present no CPAP machine is available (Female, resident, 29 years)" ... "It is very difficult to carry CPAP machine from NICU to delivery place and install before birth (Female, resident, 31 years)" " "Many times oxygen is not available in level-6 labour room (Male, resident, 29 years)" "
	Paraphernalia Supplies	- " Most of the times CPAP kit is not available and has to reuse it (Female, neonatal fellow, 32 years)" - " Blender and oxygen tubing is not working many times in delivery room (female ,resident, 27 years)" "

Motivation is the main driving force in implementing new skills or practices. Motivational paucity among HCP was noted in our study as even those we

have training in CPAP are not using it in the delivery room. This finding has also been reported from other LMICs.¹⁷

Necessitous communication among HCP regarding when, how and where to start CPAP in the newborn is another fence that has to be crossed. Golden minute optimal care of newborns requires timely and comprehensive communication among neonatal care stakeholders. This communication link is lacking, as some HCP in our study reported. This impoverished communication needs to be improved as it is a barrier to implementing CPAP in neonates.^{18,16}

Quality and quantity of trained human resources are crucial for any neonatal unit to achieve desired goals. Understaffing and frequent Staff rotation are other challenges faced in our setup. There are only a few designated nurses and neonatal fellows for permanent duty in neonatal units. A plausible explanation for this is to run other units of the department as well with limited human resources and the compulsory rotation of residents in other units. This impediment has been reported by other authors as well.^{12,19,20}

Responsibility clarity is very crucial for teamwork to achieve any goal. If there is any conflict in responsibility assignment, it will adversely affect the performance of the health care team. This conflict among team members has been reported in our study and considered a barrier to implementing an achievable and cost-effective intervention, i.e. CPAP. This conflict of responsibility leading to adverse outcomes among health care teams has been quoted by other authors as well.

In our setup, there are multiple sites where the delivery of the baby is conducted. This infra-structure-related problem has been aggravated by COVID -19 phenomenon as well. It needs more equipment and CPAP-related material supply. We have to spend more financial resources to solve this problem. Infra-structure-related barriers like electricity, oxygen and equipment shortage have been highlighted by Nigerian studies as well.¹⁵

Guidelines are formulated for easy and on-spot guidance. The lack of written guidelines for initiation of CPAP is also reported as a barrier, which is in concordance with the reported literature. Written instructions and guidelines can enhance the confidence of HCP to initiate CPAP in the delivery room.²¹

Multidisciplinary harmony is very crucial in neonatal care. Different disciplines involved in newborn baby care are Paediatrics, Obstetrics/Gynaecology and Anaesthesiology. No new intervention in the care of neonates can be successful until and unless you achieve harmony among these disciplines. This

harmony will be achieved by creating awareness among HCP of Obstetrics/Gynaecology and Anaesthesiology, which is currently lacking, as reported by participants of this study. This dearth of harmony in neonatal care has been reported in other studies as well.²²

No soldier can achieve his/her targets without bullets and guns; the same applies to health professional teams. Without necessary modern gadgets, neonatal care will be compromised handicapped. It becomes even more prudent in a human resource-restricted environment like low-middle-income countries (LMIC). Our participants have highlighted CPAP equipment deficiency as a barrier to its implementation, which is parallel to other studies.

Our study has identified different barriers related to health care professionals, hospitals, organizations, and delivery suites for implementing CPAP at the delivery place in our two tertiary care neonatal setups. To some extent, these barricades are present in every hospital in our country. Nevertheless, no one prior to our study has identified these deterrents in our country. Therefore, minimising these impediments can reduce neonatal mortality and morbidity in our country.

ACKNOWLEDGEMENT

The authors thank all the participants for their valuable time and contribution.

LIMITATIONS OF STUDY

We have not included health care professionals of other disciplines like Obstetrics/Gynaecology, Anaesthesiology and executives. These professionals may have identified more barriers. Other limitations are single Centre, small sample size and limited time frame.

CONCLUSION

Gap analysis identified that CPAP application at the delivery place is missing to optimize neonatal care in our two tertiary care neonatal units. In addition, our study identified different barriers that need to be removed for implementing delivery place CPAP. We have also suggested a multipronged approach to overcome these obstacles and enhance the application of this simple skill to achieve its potential benefits in neonatal care like less mortality, morbidity, invasive ventilation and finance.

Conflict of Interest: None.

Author's Contribution

SH:, IU:, SAUHS: Conception, data collection, analysis, drafting, final approval, accountability, MH: Conception analysis, drafting, final approval, accountability.

REFERENCES

1. Gregory GA, Kitterman JA, Phibbs RH, Tooley WH, Hamilton WK. Treatment of the idiopathic respiratory-distress syndrome with continuous positive airway pressure. *N Engl J Med* 1971; 284(24): 1333-1340. doi: 10.1056/NEJM197106172842401.
2. Alexiou S, Panitch HB . Physiology of non-invasive respiratory support. *Semin Fetal Neonatal Med* 2016; 21(3): 174-180. doi: 10.1016/j.siny.2016.02.007.
3. Vogel JP, Oladapo OT, Manu A, Gülmezoglu AM, Bahl R. New WHO recommendations to improve the outcomes of preterm birth. *Lancet Glob Health* 2015; 3(10): e589-590. doi: 10.1016/S2214-109X(15)00183-7.
4. Ho JJ, Subramaniam P, Davis PG. Continuous distending pressure for respiratory distress in preterm infants. 2015(7). Ho JJ, Subramaniam P, Davis PG. Continuous distending pressure for respiratory distress in preterm infants: *Cochrane Database Syst Rev* 2020; 10(1): CD002271.
5. Saugstad OD. Delivery room management of term and preterm newly born infants. *Neonatal* 2015; 107(4): 365-371. doi: 10.1159/000381159.
6. Morley CJ, Davis PG, Doyle LW, Brion LP, Hascoet JM, Carlin JB. Nasal CPAP or intubation at birth for very preterm infants. *N Engl J Med* 2008; 358(7): 700-708. doi: 10.1056/NEJMoa072788.
7. Sweet DG, Carnielli V, Greisen G, Hallman M, Ozek E, Te Pas A, et al. European consensus guidelines on the management of respiratory distress syndrome–2019 update. *Neonatology* 2019; 115(4): 432-450. doi: 10.1159/000499361.
8. Narendran V, Donovan EF, Hoath SB, Akinbi HT, Steichen JJ, Jobe AH. Early bubble CPAP and outcomes in ELBW preterm infants. *J Perinatol* 2003; 23(3): 195-199. doi: 10.1038/sj.jp.7210904.
9. Desai SA, Tule P, Nanavati RN. Labour room Continuous Positive Airway Pressure (LR CPAP) in preterm neonates < 34 weeks: An Indian experience. *Sudan J Paediatr* 2017; 17(2): 30-34. doi: 10.24911/SJP.2017.2.3
10. Liu L, Oza S, Hogan D, Chu Y, Perin J, Zhu J, et al. Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet*. 2016; 388(10063): 3027-3035. doi: 10.1016/S0140-6736(16)31593-8.
11. Martin S, Duke T, Davis P. Efficacy and safety of bubble CPAP in neonatal care in low and middle income countries: a systematic review. *Arch Dis Child Fetal Neonatal Ed* 2014; 99(6): F495-504. doi: 10.1136/archdischild-2013-305519.
12. Atreya MR, Lorenz JM, Narendran V. Provider perceptions of bubble continuous positive airway pressure and barriers to implementation in a level III neonatal unit in South India. *Adv Neonatal Care* 2018; 18(6): 500-506. doi: 10.1097/ANC.0000000000000510.
13. Gonçalves-Ferri WA, Martinez FE. Nasal CPAP in the delivery room for newborns with extremely low birth weight in a hospital in a developing country. *Braz J Med Biol Res* 2013; 46(10): 892-896. doi: 10.1590/1414-431X20132849.
14. Okonkwo IR, Okolo A. Bubble CPAP in Nigerian tertiary hospitals; Patented and improvised. *Niger J Paediatr* 2016; 43(4): 286-290.
15. Aneji C, Hartman T, Olutunde O, Okonkwo I, Ewumwen E. Implementing bubble continuous positive airway pressure in a lower middle-income country: a Nigerian experience. *Pan Afr Med J* 2020; 37: 10. doi: 10.11604/pamj.2020.37.10.24911.
16. Nyondo-Mipando AL, Woo Kinshell ML, Bohne C, SuwediKapesa LC, Salimu S, Banda M, et al. Barriers and enablers of implementing bubble Continuous Positive Airway Pressure (CPAP): Perspectives of health professionals in Malawi. *PLoS One* 2020; 15(2): e0228915. doi: 10.1371/journal.pone.0228915.
17. Kinshell MW, Walker CR, Hiwa T, Vidler M, Nyondo-Mipando AL, Dube Q, et al. Barriers and facilitators to implementing bubble CPAP to improve neonatal health in sub-Saharan Africa: Aa systemic review. *Public Health Rev* 2020; 41: 6. doi: 10.1186/s40985-020-00124-7.
18. Potthoff S, Presseau J, Sniehotta FF, Johnston M, Elovainio M, Avery L. Planning to be routine: habit as a mediator of the planning-behaviour relationship in healthcare professionals. *Implement Sci* 2017 ; 12(1): 24. doi: 10.1186/s13012-017-0551-6.
19. Crehan C, Colbourn T, Heys M, Molyneux E. Evaluation of ‘TRY’: an algorithm for neonatal continuous positive airways pressure in low-income settings. *Arch Dis Child* 2018; 103(8): 732-738. doi: 10.1136/archdischild-2017-313867.
20. Olayo B, Kirigia CK, Oliwa JN, Agai ON, Morris M, Benckert M, et al. Effective training-of-trainers model for the introduction of continuous positive airway pressure for neonatal and paediatric patients in Kenya. . *Paediatr Int Child Health* 2019; 39(3): 193-200. doi: 10.1080/20469047.2019.1624007
21. Crehan C, Colbourn T, Heys M. Evaluation of ‘try’an algorithm for neonatal cpap in low-income settings.. *Arch Dis Child*. 2018; 103(8): 732-738. doi: 10.1136/archdischild-2017-313867.
22. Hussain S, Sethi A. Implementation of Structured Multidisciplinary Team Training For Neonatal Resuscitation. *Pak Armed Forces Med J* 2020; 70(4): 967-974.