Vol 46 (2) June , 2022

Print: ISSN 0304 4904
Online: ISSN 2305-820X

PAKISTAN PEDIATRIC JOURNAL

A JOURNAL OF PAKISTAN PEDIATRIC ASSOCIATION

Indexed in EMBASE/Excerpta Medica, Index Medicus WHO,CPSP
IMEMR & Global Health/CAB Abstracts and UDL-EDGE Products and Services

www.pakpedsjournal.org.pk

http://www.pakmedinet.com/PPJ

SHORT COMMUNICATION

Prevalence of Vitamin D Deficiency among Cases of Neonatal Sepsis and its Association with Mortality

MIRZA SULTAN AHMED, SUMAIRA NOOR MAHM, Hadia Farooq, Rida Fatima

Pak Pediatr J 2022; **46(2):** 237-39

Correspondence to:

Mirza Sultan Ahmad
Department of Pediatrics,
Fazle Omar Hospital Rabwah, 3/2
Darul Saddar North Rabwah

E-mail:
ahmadmirzasultan@gmail.com

Received 2nd November 2021;
Accepted for publication
3rd June 2022

ABSTRACT

This study was conducted at Fazle Omar Hospital Rabwah from December 2017 to December 2018 and comprised patients admitted with neonatal sepsis. Vitamin D deficiency was present in 70% of patients. There was no significant difference between mortality rates of the neonates having vitamin D deficiency, normal Vitamin D levels and those with hypervitaminosis D.(p=0.22)

Keywords: Vitamin D, Neonatal Sepsis, Mortality.

INTRODUCTION

Vitamin D deficiency is common among pregnant women and newborn children. Study by Wierzejska RE et al showed that 54% of pregnant mothers and 37% of newborns were deficient of vitamin D. Mothers with below normal levels of vitamin D are more likely to give birth to neonates with vitamin D deficiency.[1]

Functions of vitamin D are not confined to depositing calcium in bones or controlling levels of calcium in blood. Vitamin D modifies immune response and is necessary for developing fetal immune system.[2,3]

Neonatal sepsis has got a high mortality rate and every possible avenue to reduce this high mortality rate is worth exploring. Considering this there was a need to ascertain the prevalence of vitamin D deficiency among cases of neonatal sepsis and whether there is any difference in mortality rate among different cases of neonatal sepsis according to their vitamin D status. The objectives of this study were

1. To ascertain prevalence of vitamin D deficiency among cases of neonatal sepsis
2. To ascertain whether any association is present between vitamin D levels and mortality rate among cases of neonatal sepsis

MATERIAL AND METHODS

This comparative study was conducted in the Neonatal Section of the Department of Pediatrics at Fazle Omar Hospital Rabwah, Pakistan, from December 2017 to December 2018.Approval was taken from the ethical committee of the institution. All neonates admitted in NICU of Fazle Omar Hospital, Rabwah with clinical manifestations of neonatal sepsis from December 2017 to December 2018 were divided in two groups i.e. (1) with odd admission number and (2) with even admission number. Those in the first group i.e. with odd admission number were included in this study. Informed consent was taken from the parents of the participants.

The neonates who had growth of organism in blood, urine or cerebrospinal cultures were categorized as culture proven neonatal sepsis, and those neonates who had signs and symptoms of neonatal sepsis but no growth was obtained in cultures were labeled as presumed sepsis.

Vitamin D levels were checked in these patients by Ellisa machine (Statfax 4700 Microstrip Reader). Patients were divided in three categories according to their vitamin D levels. If level of vitamin D was below 20 ng/ml [49.92 nmol/L], it was taken as vitamin D deficiency, levels between 20 and 50 ng/ml [49.92-124.8

nmol/L] was labeled normal, and levels above 50 ng/ml [124.8 nmol/L] was categorized hyper-vitaminosis D. Vitamin D deficiency was treated by Stoss therapy i.e. 100000 units IM daily for three days, for rapid correction of the deficiency followed by 800 international units orally daily on discharge for three months.

Statistical Package for Social Sciences 20 was used for analysis of data. Shapiro-Wilk test showed that vitamin D levels had non-normal distribution. Chi-square test was applied for testing association. If dependent variable was continuous with non-normal distribution, Mann-Whitney test was used to compare differences between two independent groups of continuous variables.

RESULTS

Total number of patients included in the study was 110. Median (IQR) levels of vitamin D was 14.80 (12.98) ng/ml [34.96 (32.4) nmol/l]. Median levels (IQR) of vitamin D in male and female cases included in the study were 14.40 (12.39) ng/ml [35.94 (30.93) nmol/l] and 17.1 (14.35)ng/ml [42.68(35.82) nmol/l] respectively (p=0.830).

Among the patients included in this study 9 (8.0%) patients died, 12 (10.9%) patients left against medical advice (LAMA), and 89 (80.1%) were discharged. Majority of organisms in culture proven sepsis were gram –ve i.e 68 (62%), gram positive organisms were found in 42 (38%.) cases.

Among the patients included in the study,77 (70%) had vitamin D deficiency, normal vitamin D level was present in 26 (23.6%) cases, and hypervitamonosis D was found in 7 (6.4%) cases. The difference in mortality in different categories according to their vitamin D levels is shown in table 1. Patients who left against medical advice were not included in this comparison. This shows that there was no significant difference between mortality rates of different groups according to their Vitamin D status. Median vitamin D levels of the discharged and expired cases were 14.95 ng/ml [37.32 nmol/l] and 21.44 ng/ml [53.51]. Mann-Whitney U test showed that the difference was non-significant (p=0.69)

TABLE 1: Mortality rates in different groups according to vitamin D status (12 patients who left against medical advice are not included in this comparison) n=98

Category of vitamin D	Dis-charged	Expired (%)	Total
Vit. D deficiency	64	4 (6.9)	68
Normal vit. D	20	4 (16.6)	24
Hypervitaminosis D	5	1 (16.6)	6

p=0.22

DISCUSSION

Vitamin D acts as an agent that modifies the immune system and it has been shown that it influences the development of immune system of the fetus and consequently protects from infections in the neonatal period. Study by Hornsby E showed that babies born to those mothers who received 4400 IU/ day of vitamin D during last two trimesters of pregnancy had higher levels of proinflammatory cytokines like interleukin 6, interleukin 8, granulocyte mononuclear colony stimulating factor, interferon gamma after their mononuclear cells were stimulated by different stimuli. Similarly when their cord blood mononuclear cells were stimulated by dexamethasone, they produced higher levels of interleukin 10.[4]

It has been shown by numerous studies that vitamin D deficiency can lead to detrimental effects on the immune system. Many studies ascertained whether critically ill patients have significantly lower vitamin D levels as compared with patients who are not critically ill. Jeng L et al showed that those patients who were critically ill had significantly lower vitamin D levels as compared with the patients who were not critically ill. In addition to that, among critically ill patients, those who were having sepsis had significantly lower vitamin D levels as compared with those who were not having sepsis. This study also demonstrated that when patients were given Vitamin D, the neutrophils and macrophages started producing more cathelicidin (LL-37). As cathelicidin (LL-37) has got antimicrobial properties, this enhanced innate immunity. It shows that increased levels of vitamin D can lead to better innate immunity.[3]

Different studies have shown that patients with vitamin D deficiency require longer stay in hospital and suffer higher mortality rate.[5,6]

In our study the comparison between mortality rates of different groups according to vitamin D status show that, though mortality rate among the patients having vitamin D deficiency was less than the patients with normal or raised vitamin D levels but the difference was non - significant.

CONCLUSIONS

1. Vitamin D deficiency was present among 70% of the neonates admitted with neonatal sepsis.
2. Mortality rates of the patients of neonatal sepsis with vitamin D deficiency is not significantly different from the patients with normal or raised vitamin D levels.

Conflict of Interest: None to Declare

Funding Sources: None to Declare

Authors' affiliation

Mirza Sultan Ahmed, Sumaira Noor Mahm, Hadia Farooq, Rida Fatima
Department of Pediatrics,
Fazle Omar Hospital Rabwah, 3/2 Darul Saddar North Rabwah

REFERENCES

1. Wierzejska RE, Wojda BK. Vitamin D Status during Pregnancy versus the Anthropometric Parameters of Two-and Four-Year-Olds: A Pilot Study. Nutrients. 2022 Jan;14(2):254.
2. Cyprian F, Lefkou E, Varoudi K, Girardi G. Immunomodulatory effects of vitamin D in pregnancy and beyond. Frontiers in immunology. 2019:2739.
3. Jeng L, Yamshchikov AV, Judd SE, Blumberg HM, Martin GS, Ziegler TR, Tangpricha V. Alterations in vitamin D status and anti-microbial peptide levels in patients in the intensive care unit with sepsis. J Transl Med. 2009 Apr 23;7:28.
4. Hornsby E, Pfeffer PE, Laranjo N, Cruikshank W, Tuzova M, Litonjua AA, Weiss ST, Carey VJ, O'Connor G, Hawrylowicz C. Vitamin D supplementation during pregnancy: Effect on the neonatal immune system in a randomized controlled trial. J Allergy ClinImmunol. 2017 May 16. pii: S0091-6749(17)30575-4.
5. He M, Cao T, Wang J, Wang C, Wang Z, Abdelrahim ME. Vitamin D deficiency relation to sepsis, paediatric risk of mortality III score, need for ventilation support, length of hospital stay, and duration of mechanical ventilation in critically ill children: A meta-analysis. International Journal of Clinical Practice. 2021 Apr;75(4):e13908.
6. Vipul P, Shuchi C, Avinash A, Manish G, Sukriti K, Ved P. Correlation of serum vitamin D level with mortality in patients with sepsis. Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine. 2017 Apr;21(4):199.