

Original Research

Role of Vitamin D level causing postoperative respiratory complications in the patients treated under General Anaesthesia

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ABSTRACT:

Background-Vitamin D is obtained by the photochemical route from dehydrocholesterol in the skin which is a fat soluble vitamin and its deficiency is a commonly observed health issue. Vitamin D have a modulatory effect on inflammation, contraction and remodelling pathways of smooth muscles cells in the airway. The prevalence of Vitamin D deficiency is increasing day by day in the general population throughout the world with the increasing evidences that shows it has an impact on respiratory health too. **Materials and method-**The study was performed in the private hospital with 50 cases aged from 20 to 60 years were included in the study who were operated under general anaesthesia while patients underwent thoracic surgery, patients with difficult intubation, other systemic diseases related with endocrine or neuromuscular disorders were excluded from the study. **Results-** Weight, vitamin D levels and duration of the anaesthesia in the postoperative cases. Patients were distributed on the basis of gender in males and females. 21 cases belongs to female patients while 29 patients were males. Mean for the parameters of age (F=47.43 M=46.20, p=.0820) weight (F=73.01M=76.63, p=0.121) vitamin D levels (F=11.42 M=14.2, p=0.027) and duration of the anaesthesia was (F=62.28 M=70.1, p=0.056) were observed. **Conclusion-** Identifying Vitamin D deficiency in postoperative period and bringing the levels back to normal requires a long term process. We believe that patients in advanced age group and who underwent elective surgery, optimizing the Vitamin D levels in the preoperative period will be beneficial in terms of preventing respiratory complications.

Key words: Anaesthesia, respiratory complications, Vitamin D.

Received: 22 February, 2020

Accepted: 13 March, 2020

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This article may be cited as: Rai SK, Raghuvanshi R. Role of Vitamin D level causing postoperative respiratory complications in the patients treated under General Anaesthesia. J Adv Med Dent Sci Res 2020;8(4):12-15.

INTRODUCTION-

Vitamin D is obtained by the photochemical route from dehydrocholesterol in the skin which is a fat soluble vitamin and its deficiency is a commonly observed health issue.^[1,2] Vitamin D have a modulatory effect on inflammation, contraction and remodelling pathways of smooth muscles cells in the airway.^[3] The prevalence of Vitamin D deficiency is increasing day by day in the general population throughout the world with the increasing evidences that shows it has an impact on respiratory health too.^[4,5] Studies have shown that vitamin D deficiency increases mortality in respiratory tract infections and respiratory tract diseases.^[6] There is a correlation between serum Vitamin D levels with inflammatory processes and lung capacity which can be very clearly seen in lung diseases such as asthma, chronic obstructive pulmonary disease (COPD), and

pneumonia.^[7,8] Administration of anaesthesia or any surgical intervention cause unwanted effects on the cardiopulmonary functions of patients with the increased prevalence of complications in cases of general anaesthesia as compared to the other anaesthesia methods.^[9]

To minimise the rate of mortality and morbidity it is important to complete the preoperative evaluation thoroughly, especially for patients with additional respiratory diseases or with the potential risk of developing complications. There are many studies related to Vitamin D deficiency that involves general diseases related to the musculoskeletal and respiratory system but very few literature is available related to the aforesaid study in surgical patients. Majority of the studies are related to the postoperative complications such as cardiac morbidity, and postoperative pain.^[10] but we came across very less

literature on any correlation between respiratory complications and Vitamin D levels. In the present study we aimed to investigate that is there is any correlation between preoperative Vitamin D levels and respiratory complications in the, recovery, induction, extubation and early postoperative period in patients undergoing general anaesthesia.

MATERIALS AND METHODS-

The study was performed in the Department of Anaesthesia, Hind Institute of Medical Sciences Ataria Sitapur U.P., India with 50 cases aged from 20 to 60 years were included in the study who were operated under general anaesthesia while patients underwent thoracic surgery, patients with difficult intubation, other systemic diseases related with endocrine or neuromuscular disorders were excluded from the study. Ethical clearance was obtained by the ethical committee of the centre. Heart rate, arterial pressure, pulse rate, and neuromuscular block monitoring were performed when the patients arrived in the operating room. Maintenance fluids were begun by intravenous line and the standard anaesthesia protocol was applied. Postoperative outcomes that is respiratory complications were defined only in the acute period of 24 hour episode. Postoperative requirements for mechanical ventilation support was defined as acute respiratory failure.

Laboratory protocols were maintained by collecting the blood samples for determining the vitamin D levels. Fasting samples were collected early morning two hour before the induction of anaesthesia.

For statistical analysis Shapiro–Wilk test was used (P>0.05) to check the assumption of normality for sex, age, anesthesia duration, and all other

comparative parameters with Vitamin D values. Differences in terms of Vitamin D levels were assessed with the Student’s-t-test, with differences between these values according to surgical operation type tested with the ANOVA test. Data were analyzed using the SPSS ,version 21.0.

RESULTS-

Table 1 shows age, weight, vitamin D levels and duration of the anaesthesia in the postoperative cases. Patients were distributed on the basis of gender in males and females. 21 cases belongs to female patients while 29 patients were males. Mean for the parameters of age (F=47.43 M=46.20, p=.0820) weight (F=73.01M=76.63, p=0.121) vitamin D levels (F=11.42 M=14.2, p=0.027) and duration of the anaesthesia was (F=62.28 M=70.1, p=0.056) were observed.

Table 2 demonstrate different surgery type and their frequency in percentage in which we found lower abdominal surgery in higher frequency with 30.2%

Table 3 shows types and frequency of postoperative respiratory complications. Frequency of the bronchospasm in induction period was 13.6 while frequency for cough, bronchospasm, desaturation was 17%, 8.5%, 28.5% respectively in extubation period. Frequency of desaturation was 31.7% in recovery phase.

Table 4 shows levels of vitamin D in cases with or without complications where p value for Bronchospasm during induction, Cough during extubation, Bronchospasm during extubation Desaturation during extubation and Desaturation during recovery was observed as 0.014, 0.002, 0.011, <0.001 and <0.001 respectively.

TABLE-1 Weight, Age, Vitamin D levels, and duration of anaesthesia in patients

PARAMETERS	GENDER	N	MEAN	SD	P VALUE
Age (year)	Female	21	47.43	1.942	0.820
	Male	29	46.20	1.940	
Weight (kg)	Female	21	73.01	1.921	0.121
	Male	29	76.63	1.457	
Vitamin D(ng/mL)	Female	21	11.426	0.9721	0.027
	Male	29	14.200	0.8867	
Duration (min)	Female	21	62.28	2.940	0.056
	Male	29	70.10	3.187	

SD=Standard deviation

TABLE- 2 DISTRUBITION OF THE CASES ACCORDING TO OPERATION TYPES

SURGERY TYPE	FREQUENCY (%)
Lower abdominal	12 (30.2)
Upper abdominal	7 (12.4)
Extremity	5(6.3)
Eye	8 (16.4)
Upper airway	6(11.2)
Head–neck	8 (17.2)
Spine	4 (6.3)
Total	50 (100.0)

TABLE-3 TYPES AND FREQUENCIES OF RESPIRATORY COMPLICATIONS IN PATIENTS

PERIOD	COMPLICATION	N (%)
Induction	Bronchospasm	8 (13.6)
Extubation	Cough	10 (17.0)
	Bronchospasm	5 (8.5)
	Desaturation	10 (28.5)
Recovery	Desaturation	17 (31.7)

TABLE-4 VITAMIN D LEVELS IN CASES WITH OR WITHOUT COMPLICATIONS

COMPLICATION TYPE	COMPLICATION						P
	NO			YES			
	N	MEAN	SD	N	MEAN	SD	
Bronchospasm; I	46	13.52	0.71	10	8.62	1.72	0.014
Cough; E	27	13.26	0.70	11	8.78	1.46	0.002
Bronchospasm; E	36	13.44	0.72	7	7.82	1.72	0.011
Desaturation; E	27	14.47	0.81	14	8.74	0.77	<0.001
Desaturation; R	24	15.02	0.82	8	8.89	0.78	<0.001

Bronchospasm; I=Bronchospasm during induction;
 Cough; E=Cough during extubation;
 Bronchospasm; E=Bronchospasm during extubation;
 Desaturation; E=Desaturation during extubation;
 Desaturation; R=Desaturation during recovery;
 SD=Standard deviation

DISCUSSION-

Respiratory complications are one of the most important factor causing increased morbidity and mortality related to general anaesthesia.[9] Commonly observed complications are desaturation, laryngospasm, bronchospasm, cough, and excessed secretions. [11,12] In which Desaturation was identified as the most common complication among the cases in our study [Table 3]. Considering the strong correlation between desaturation and similar perioperative respiratory complications with comorbidities, the necessity to effectively perform preoperative evaluation and preparation is obvious.[13] A fully-performed preoperative evaluation can reduce the morbidity and mortality linked to these complications.[14] Studies have shown that a correlation exists between serum Vitamin D levels and lung functions. Low Vitamin D levels decreases the lung capacity and causes the destruction of lung parenchyma. Anaesthesia related pulmonary complications such as bronchospasm, respiratory failure and reintubation are related to increased mortality rates.[13]

A retrospective study of 3509 patients undergoing noncardiac surgery assessed the effect of Vitamin D levels on postoperative mortality and reported that Vitamin D levels below 13 ng/ml were correlated with increased mortality and morbidity.[2] Study by Quraishi et al. on bariatric surgery showed that low Vitamin D levels were related to postoperative complications.[10] Data’s published by National Health and Nutrition Examination Survey 2001–2006 show that though low Vitamin D levels are significantly correlated with the respiratory symptoms.[15] In our study, a significant correlation observed between serum Vitamin D levels

and respiratory complications related to general anaesthesia. In terms of bronchospasm in the induction period, and cough, bronchospasm, and desaturation in the extubation period and early postoperative recovery period, a significant difference identified for the preoperative Vitamin D. According to our study, the serum Vitamin D levels of patients with bronchospasm during extubation were at lowest levels among all patients. While the patients experiencing perioperative bronchospasm and desaturation in the recovery period had significantly lower levels of Vitamin D compared to cases without complications. The most significant postoperative pulmonary complication of reintubation is known to increase the mortality risk by ten times.[13] In addition, Vitamin D deficiency is present in more than half of all patients admitted to hospital in general and this deficiency is known to be related to muscle weakness most often in the proximal muscle groups.[16] In our study, though requirements for reintubation and mechanical ventilation support were not observed, it is known that low Vitamin D levels are related to poor clinical outcomes and these low levels cause nerve dysfunction.[17]

CONCLUSION-

Identifying Vitamin D deficiency in postoperative period and bringing the levels back to normal requires a long term process. We believe that patients in advanced age group and who underwent elective surgery, optimizing the Vitamin D levels in the preoperative period will be beneficial in terms of preventing respiratory complications.

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