Study on the Incidences of Hypovitaminosis D in Acute Coronary Syndrome Patients

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Abstract

Aim: Aims of this study was to evaluate vitamin D deficiency as an independent risk factor for acute Coronary Artery Disease and to assess its severity at various aged patients.

Methods: A total of 268 patients were included in this study which was an observational cohort study. Based on the inclusion and exclusion criteria, patients who were admitted in the Intensive Coronary Care Unit at Fortis Fit Rajan Dhal Hospital were selected and categorized as male or female and from 18 years upper aged groups such as 21-30 years, 31 to 40 years, 41 to 50 years, 61 to 70, 71-80, 81-90 and above 90 years.

Results: In this study Hypovitaminosis D was higher in male (75.7%) than female (24.3%) and the incidences of Hypovitaminosis D was highest to lowest in the following order; very higher in 51-60 years aged patients (41-50) years aged patients, 61-70 years aged patients, 71-80 years aged patients, 81-90 years aged patients, 21-30 years aged patients and lastly 91-100 years aged patients. From the total incidences only 118 were estimated for normal coronaries, 43 ACS/NSTEMI and 107 for STEMI. Therefore, the representation of vitamin D level severe deficiency < 10 was seen in 47 Normal coronaries individuals, 17 in ACS/NSTEMI and 54 in STEMI. Similarly, deficiency < 20 of vitamin D level was observed in 24 Normal coronaries, 16 in ACS/NSTEMI and 27 in STEMI individuals. Progressively insufficiency (21-29) of vitamin D level has seen in 18 normal coronaries, 3 in ACS/NSTEMI and 18 in STEMI individuals. Lastly normal level of (vitamin D>30) was seen in 28 normal coronaries, 7 in ACS/NSTEMI and 8 in STEMI individuals. Regularly, hypertension is demonstrated in 57 normal coronaries, 28 in ACS/NSTEMI and 27 in STEMI individuals.

Conclusion: There was significant correlation between hypovitaminosis D and coronary artery disease. Consequently, the early detection and management of hypovitaminosis D is essential to control unfavorable cardiovascular events.

Recommendation: Vitamin D supplementation should be given to patients with ACS and cardiac failure will decreases inflammatory indicators and develops health effects.

Keywords: Risk factor, Hypovitaminosis D, incidences, insufficiency, mortality, morbidity, dysfunction.
INTRODUCTION

Coronary artery disease and its vascular problems are the common cause of death and higher risk for the people worldwide. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths (WHO, 2019). The occurrence of cardiovascular illness has speedily increased in recent years. Although there are many well recognized threading and risk factors for heart disease, increasing accounted risk factors are being evaluating by various epidemiological studies and continue to be a significant feature of argue concerning their nature of association and the role they occupy in reducing mortality and disability due to cardiovascular problems (Gupta & Rastogi., 2003).

Over the past 20 years, there has been much emphasis and investigation over these risk factors i.e. Vitamin D shortage and deficiency which is now catching benefits from many medical and nutritional communities as knowledge emerges of its natural function and its involvement with reducing risk of many chronic problems (Yusuf et al., 2004). Vitamin D is main regulator of bone and calcium metabolism, its poor status with coronary artery calcification and cardiac dysfunction, as well as positive link with hypertension, diabetes, metabolic disorders, atherosclerosis, peripheral arterial sickness, cancer and many autoimmune diseases (Lo et al., 1985).

Hypovitaminosis D has been connected to an increased risk of coronary artery disease and cardiovascular mortality rate. Endothelial problems play a vital role in the pathogenesis of coronary artery sickness and hypovitaminosis D, which is hypothesizing to promote endothelial problems. Subsequent the finding of the expression of Calciferol receptors and 1α hydroxyl’s in the myocardium and endothelium, several vital mechanisms that linkage to Calciferol with Coronary Artery Disease and its risk factors have been recognized. vitamin D mainly performs through its role in preserving calcium homeostasis and gene transcription to avoid cardiovascular illnesses and its risk factors (Bischoff et al., 1922).

The word acute coronary syndromes express a variety of clinical syndromes that are divided into those with ST elevation or new left bundle branch block and those with unstable angina and non ST elevation MI (Goswami et al., 2008). The data of Arya and Goswami (2008) have shown that cardiovascular and heart problems, morbidity and mortality rate are 30-50% more in the regions of less sun contact due to season or room staying and that death from coronary artery disease is highest in winter (Arya et al., 2004; Goswami et al., 2008). All these mentioned above researches point to a contributory association of Vitamin D, as its serum levels decreases in people who survive away from the equator because of reduced contact to ultraviolet rays. The occurrence of hypovitaminosis D is always higher in dark skinned and elderly people (Robyn et al., 2008).

Several studies globally have confirmed that myocardial infarction (MI) patients have lower vitamin D levels than control subjects. It was postulated that those with low vitamin D levels had almost 60% higher risk of myocardial infarction than those with the highest levels (Norman., 2008). Therefore, the increasing proportions of coronary artery disease in Asian countries, only inadequate data are accessible on the relationship between vitamin D, coronary artery disease and endothelial problems. While numerous epidemiological studies have shown significant association of hypovitaminosis D with numerous cardiovascular risk factors like diabetes, Hypertension and dyslipidemia. The incidence of hypovitaminosis D itself as an independent risk factor for cardiovascular Death is still unclear. Since Hypovitaminosis D can be easily calculated and treated, trials to study the effect of vitamin D deficiency and its supplementation to control and treat
cardiovascular diseases are presently considered important areas of many researches (Holick & Garabedian, 2006).

The increasing rate of coronary artery sickness and the associated problems, causes and death rate make it needed to extend further research in this research population. Many researchers have studied and many are reviewing the vitamin D status in these patients. Thus, this research was aimed to determine whether the presence of hypovitaminosis D has major connection with acute Coronary syndrome.

**Aim of the Study**

To study the incidences of hypovitaminosis D in study population and to assess its severity at various aged patients.

**MATERIAL AND METHODS**

The present prospective open labeled parallel group study was completed in Fortis Fit Rajan Dhal Hospital from September 2019 to December 2020. Total population of the present cohort study was 828 patients.

**Inclusion Criteria**

1. Patients with acute ST Elevation Myocardial Infarction admitted in the Intensive Coronary Care Unit at Rajan Dhal Hospital were selected as nonrandomized consecutive trial and Target population are categorized by male and female and from 18 years upper aged groups such as 21-30 years, 31 to 40 years, 41 to 50 years, 61 to 70, 71-80, 81-90 and above 90 years.
2. Patients with Diabetes / Hypertension / Coronary Artery Disease who attended the medical OPD were selected as prospective study.

**Methodology**

Patients admitted with acute ST Elevation Myocardial Infarction in the Coronary Care Unit of Rajan Dhal Hospital were chosen as cases. A data collection form was prepared for Anamnesis such as name, age, sex, occupation, address, complaints, past medical history, smoking, alcoholism, drug intake and other relevant history. General examination with examination of the vital signs, heart rate, respiratory rate, pulse, blood pressure and body temperature has done. From each patient’s clinical background was recorded and the ECG and ECHO reports of the patients were noted.

Blood samples were drawn at the time of admission to measure the serum levels of 25 (OH) Vitamin D, Random blood sugar, and lipid profile. Renal function and hepatic function were assessed by measuring the urea, creatinine and total protein, serum bilirubin, serum albumin levels respectively. Serum levels of 25 (OH) Vitamin D were measured using Chemo Luminescence Immuno Assay technique. Data was analyzed in Microsoft Excel spreadsheet and also analysis was done with the use of standard SPSS (Statistics Products Services Solutions) 16.0 software package. Descriptive statistics were used to calculate the frequency, mean and percentage.
RESULT

Acute coronary syndromes explain a variety of clinical syndromes that are classified into those with ST elevation or non-ST elevation MI. Researchers concluded that having low levels of vitamin D (<17.8 ng/mL) was independently associated with an increase in all-cause mortality in the general population. According to present study Hypovitaminosis D is presented higher in male (75.7%) than female (24.3%). Regarding study result of Hypovitaminosis D was distributed by age. Therefore, the incidences of hypovitaminosis D was highest to lowest in the following order; very higher in 51-60 years aged patients (41-50) years aged patients, 61-70 years aged patients, 71-80 years aged patients, 31-40 years aged patients, 81-90 years aged patients, 21-30 years aged patients and lastly 91-100 years aged patients as summarized in figures 1 and 2.

The total population of present study was 268 individuals and their incidence of population was estimated for normal coronaries 118, 43 ACS/NSTEMI and 107 for STEMI. So, the representation of vitamin D level severe deficiency < 10 was seen 47 in normal coronaries, 17 in ACS/NSTEMI and 54 in STEMI. Similarly, deficiency < 20 of vitamin D level have seen 24 in normal coronaries individuals, 16 in ACS/NSTEMI and 27 in STEMI studying population. Progressive insufficiency (21-29) of vitamin D level have seen 18 in normal coronaries, 3 in ACS/NSTEMI and 18 in STEMI individuals. Lastly, normal level of (vitamin D>30) has seen 28 in normal coronaries individuals, 7 in ACS/NSTEMI and 8 STEMI individuals as summarized in figures 3 and 4. Regularly, study patients related to hypertension, diabetes mellitus & hyperlipidemia, there are the present study have demonstrated hypertension in 57 normal coronaries, 28 in ACS/NSTEMI and 27 in STEMI individuals. Also, diabetes mellitus was seen in 44 normal coronaries, 20 in ACS/NSTEMI and 30 in STEMI individuals.

Although, hyperlipidemia have been presented in 9 normal coronaries individuals, 0 percent in ACS/NSTEMI and 18 in STEMI individuals. Lastly, the follow up of one-year data have shown that, mortality of the normal coronary’s individuals are 0%, NSTEMI/UA 1(2.32%) and STEMI were 2(1.9%). Therefore, re-hospitalization for ACS in the present study normal coronaries individuals were 2(1.7%), NSTEMI/UA 2(4.6%) and STEMI was 6(5%). But re-hospitalization for ADHF in the present study normal coronaries individuals were 0%, NSTEMI/UA 1(2.32%) and STEMI individuals were 3(2.8%). Finally, the other relevant clinical events of normal coronaries individuals were 0.19%, NSTEMI/UA 1(2.32%), and STEMI individuals were 1(0.9%) as summarized in figures 5 and 6.

Figure 1: Gender distribution of hypovitaminosis D

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Figure 2: Age distribution of hypovitaminosis D by years

Figure 3: Study population of hypovitaminosis D by type
Figure 4: Graphical representation of vitamin D level in normal coronaries, ACS/NSTEMI & STEM

Figure 5: Study patients related to hypertension, diabetes mellitus & hyperlipidemia
DISCUSSION

According to the World Health Organization’s description, by the year 2020, cardiovascular diseases will be the principal cause of mortality and morbidity in Asian countries (WHO, 2019). A study indicated that the overall self-reported prevalence of diagnosed CVDs was 29.4% for older adults age 45 and above in India. Age was associated with increased risk of CVD. Female older adults were more likely to have CVDs than male. The place of residence also had a stronger association with CVDs. In addition, high cholesterol, diabetes and physical inactivity were key risk factors for CVDs (Kundu and Kundu 2022). The present study follows up of one-year data have shown that, Mortality of the normal coronaries’ individuals are 0%, NSTEMI/UA 1(2.32%) and STEMI were 2(1.9%).

Disability adjusted life years lost from Coronary Heart problems in India are expected to twice from the year 2000 to 2020 in both males and females to 7.7 million and 5.5 million, respectively (Gupta and Rastogi., 2003). Cardiovascular problem and diseases are grading as the major cause of mortality in male upper aged patients, left over the second in young old persons (Xiang et al., 2005). Death percentage due to cardiovascular diseases for males is higher than females (Djoussé et al., 2020). Toward appointment, several studies recommended a link between low 25(OH) Calciferol levels and increased risk of mortality rate from cardiovascular basis was suggested (Rodriguez et al., 2018). A research based on an investigation of more than 1000 Polish patients confirmed the previously details low vitamin D levels in the Polish people (Forman et al., 2007), by way of the higher 25(OH) D amount in males than in females (Shane et al., 1997).

Therefore, the present study approved that, hypovitaminosis D was higher in males ACS individuals than females, and its incidences were occurred higher in middle years aged individuals.
than upper aged and lower aged persons and mortality of the normal coronaries’ individuals are 0%, NSTEMI/UA 1(2.32%) and STEMI were 2(1.9%). Prominently, in patients with heart dysfunction, atrial fibrillation, or coronary artery disease hypovitaminosis D was presented with a poorer prediction (Talmor et al., 2008). Moreover, vitamin D deficiency was documented to affect the recognized cardiovascular risk factors such as arterial hypertension(Kunutsor et al., 2013), type 2 diabetes, or dyslipidemia (Hyppönen et al., 2008).

The outcome of randomized clinical experiment (VITAL, ViDa, D2d), which incorporated over 30,000 applicants, demonstrated that supplementation with vitamin D does not control cardiovascular trial or the series of type 2 diabetes (Kern et al., 2003). Vitamin D, by restrain the rennin angiotensin axis acts a vital role in controlling hypertension and preventing its unfavorable effects on the cardiac output. Vitamin D recovers insulin sensitivity thus dropping the incidence of diabetes mellitus and the related risk of accelerated atherosclerosis (Bray., 1992). Comparatively, the present study has demonstrated that, hypertension related individuals were higher in normal coronaries, ACS/NSTEMI and then STEMI individuals. Also, diabetes mellitus was seen higher in normal coronaries, STEMI and then in ACS/NSTEMI individuals. Belongs with that in present study, hyperlipidemia have been presented higher in normal coronaries, STEMI and then in ACS/NSTEMI individuals.

Correspondingly, the large National Health and Nutrition assessment Survey counting data from 8531 applicants demonstrated that hypo vianmiosis D was occur in almost 90% of patients with associated coronary heart disease and HF (odds ratio (OR): 3.52; 95% CI: 1.58–7.84).27 Anderson et al (Cobas., 2021). The present data was also confirmed that, hypo vitiminosis D associated coronary heart disease and HF. Subgroup analyses demonstrated that calcium and vitamin D supplementation was occurred with lower risk of HF (HR: 0.63; 95% CI: 0.4–0.8 in the low-risk subgroup (Pludowski et al., 2013).

Few RCTs evaluated the consequence of vitamin D supplementation on the purposeful outcome of patients with HF. (Witham et al., 2009) demonstrated vitamin D supplementation did not recover functional capacity or value of life in upper aged patients with systolic HF who had baseline 25(OH)D3 fewer than 20 ng/mL and who were randomized to get 100,000 IU of oral vitamin D2 or placebo at baseline and at 10 weeks, and who were followed up for 20 weeks (Ringqvist., 1983). Szulc et al (2009) completed a systematic evaluation and meta-analysis to verify whether vitamin D supplementation decreases inflammatory indicators and develops health effects for patients with heart failure.

It has been recognized for a extended time that hypovitaminosis D is associated with renin–angiotensin–aldosterone system (Johansson et al., 2012; Scragg et al., 1990), where in vitro and animal studies found that vitamin D suppresses renin–angiotensin–aldosterone system which is identified to supply high blood pressure (Ng et al., 2013). Present study also certify vitamin D affect blood pressure and this also create in human study among 61 persons conducted by De Metrio et al (2015) who initiate that plasma renin activity is inversely correlated to 1,25(OH)2D3 (r = –0.65) which can affect blood pressure. Correia et al (2013) explained by another study in persons with balanced dietetic sodium intake demonstrated that those who were vitamin D inadequate (25(OH)D3 levels: 15.0–29.9 ng/mL) or lacking (25(OH) D3 levels <15.0 ng/mL) had considerably higher levels of angiotensin II levels when evaluated with those with enough levels (Gagnon et al., 2012). These human data recommend that vitamin D has an inhibitory property on
renin–angiotensin–aldosterone system. Though, vitamin D play a role in rising the influx of Ca+2 into the vascular smooth muscles resulting in improved contractility, which in turn promotes blood pressure. vitamin D also increase influx of Ca+2 in the juxtaglomerular cells, which in turn restrain renin secretion. It is unclear whether vitamin D function on blood pressure was pro-hypertensive or antihypertensive. Similarly, the present study has demonstrated that, hypertension have seen in 57 normal coronaries individuals, 28 in ACS/NSTEMI and 27 in STEMI individuals.

It has been expected that 1 billion people globally suffer from Vitamin D deficiency or insufficiency (Hollick., 2007). Worldwide Reports of Acute Coronary proceedings data from 2007 demonstrated that 38% of patients had STEMI, 29% had NSTEMI and 29% had unbalanced Angina. Amongst women, unbalanced Angina and Non-STEMI were more common than STEMI. On the other hand, amongst men, STEMI was more common. Non-STEMI was more common in upper aged men than in younger men (Eric et al., 2007). Comparatively in present study Hypovitaminosis D severe deficiency, deficiency and insufficiency were calculated in normal coronaries and STEMI individuals than ACS/NSTEMI, and normal level of vitamin D were seen higher in normal coronaries than STEMI and ACS/NSTEMI individuals.

CONCLUSION
The present findings are showing that, hypovitaminosis D was higher in males ACS individuals than females, and its incidences were higher in middle aged individuals. Otherwise Hypovitaminosis D were higher in normal coronaries and STEMI population type than ACS/NSTEMI. Also, hypovitaminosis D severe deficiency, deficiency and insufficiency were calculated in normal coronaries and STEMI individuals than ACS/NSTEMI, and normal level of vitamin D were higher in normal coronaries than STEMI and ACS/NSTEMI individuals. The present study has demonstrated that hypertension related individuals were higher in normal coronaries, ACS/NSTEMI and then STEMI individuals. Also, diabetes mellitus was higher in normal coronaries, STEMI and then in ACS/NSTEMI individuals. Hyperlipidemia have been presented higher in normal coronaries, STEMI and then in ACS/NSTEMI individuals. Lastly, the follow up of one-year data have shown that mortality of individuals were higher in STEMI and NSTEMI/UA. Therefore, re-hospitalization for ACS in the present study normal coronaries individuals was lower than NSTEMI/UA and STEMI individuals. So, this study recommends that vitamin D supplementation can decreases inflammatory indicators and develops health effects for patients with ACS and heart failure. The early detection and management of Vitamin D deficiency is essential to prevent adverse cardiovascular events.

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Conflict of Interest
The author expresses no conflict of interest in any part of the research.

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