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# Effect of Alfacalcidol (25-Hydroxycholecalciferol) Supplementation on Sports Performance of Female Weightlifters in Pakistan

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## Abstract

Health is essential for the common man in general and for the sportsmen in particular. Weightlifting is an intense sports, since competitors draw on all their mental and physical strength to lift massive weights, often more than twice their own body weight. Vitamin is an organic compound, the need of which is fulfilled automatically, but due to odd selection of food, deficiencies of the vitamins persist, environmental conditions and health effects vitamins are required to be taken orally. The objective of the current study is to examine the effect of Alfacalcidol supplementation on change serum calcidiol level on bone muscle strength of female weightlifters of Pakistan through change in their best weightlifting capacity and serum calcidiol level after supplementation of Tab. Cadla containing Alfacalcidiol 0.5mcg for a period of 4 months in different groups of female weightlifters of Pakistan using pre-test post-test analysis. Paired sample t-test was used to measure the mean change in best weightlifting capacity and serum calcidiol level (ng/ml) whereas serum calcidiol was measured using LIAISON® 25 OH Vitamin D Total (Kit No. 310600) through Liquid Chromatography-tandem Mass Spectrometry (LC-MS/MS) methods. Overall results showed that there is an escalation in serum calcidiol level cause an increase in the lifting best total of female weightlifting players which cause an increase in their weight lifting capacity and muscular strength due to supplementation of Tab. Cadla (0.5mcg).

**Keywords:** Alfacalcidol, Weightlifting, Female Players, 25-Hydroxycholecalciferol

## Introduction

Vitamins have various biochemical utilities, a few, like Vitamin D, have the role like hormone because it regulates metabolism of mineral and controls the development of tissue and cell demarcation (Like some types of vitamin A): others purpose as antioxidants (for example vitamin E and from time to time vitamin C) (David, 2009). Vitamins can be categorized either fat soluble or water soluble, 13 vitamins in total are used by humans: 9 water soluble (Vitamin C and 8 B vitamins) along with 4 fat soluble (A, D, E and K): water soluble category of vitamins liquefy effortlessly in water and may be excreted from body voluntarily, its utilization in body can be judged through odour and colour in urinary output (Fukuwatari et al., 2008). While water soluble vitamins cannot be accumulated readily in the body, so its intake is vital

on regular basis (Bellows et al, 2008). Several kinds of water soluble vitamins are manufactured by bacteria (Said et al., 2006). Lipids (Fats) help the absorption of fat soluble vitamins through intestinal tract as they are expected to build up within the body, that may cause the hypervitaminosis as compared to water soluble vitamins, in the process of cystic fibrosis, the regulation of fat soluble vitamin is of particular importance (Maqbool et al., 2008). An athletic discipline of weightlifting is a part of the modern Olympic Games in which a weightlifter attempts to lift maximum weight on barbell loaded with weight plates (International Weightlifting Federation, www.iwf.net, retrieved 2024-07-08). Weightlifting competitions categorized in order of the snatch and the clean & jerk, every weightlifter gets 3 attempts in each category of snatch and the clean & jerk and collective total of the maximum two successful lifts decides the end result in a bodyweight class (International Weightlifting Federation, www.iwf.net, retrieved 2024-07-08). There are different bodyweight classes for men and women, for a complete entry in competition a weightlifter has to lift weight successfully at least once in both categories of the snatch and the clean and jerk (International Weightlifting Federation, www.iwf.net, retrieved 2024-07-08). Olympic weightlifting is an assessment of human explosive strength (Ballistic limits) and is therefore performed with speed and more mobility and with superior range of motion in contrast of other strength sports (International Weightlifting Federation, www.iwf.net, retrieved 2024-07-08). Both the snatch and the clean and jerk are explosive and dynamic if executed properly, especially it looks attractive and elegant when seen from a recording at a slower motion (International Weightlifting Federation, www.iwf.net, retrieved 2024-07-08).

**Literature Review of the Study**

Usually vitamin D is a vitamin which is in fact not a vital vitamin needed nutritionally to our body as it can be manufactured in sufficient quantity by nearly all mammals exposed to sunlight (Wolf, 2004). A vitamin will only be categorized as indispensable vitamin when it cannot be produced in enough quantity by human being and it has to be obtained from diet, vitamin D was however exposed in an attempt to discover the dietary substance whose deficiency may cause disease like rickets, a form of osteomalacia in childhood (Wolf, 2004). Vitamin D belongs to the cluster of fat soluble secosteroids which are liable for increasing absorption of phosphate, iron, zinc, calcium and magnesium in the intestinal tract of human, the vital members of this group are ergocalciferol ($D_2$) and cholecalciferol ($D_3$): both vitamin $D_2$ and $D_3$ can be consumed through the dietary substances and from supplements (Holick, 2006).

Dearth of vitamin D has turned out to be global concern in the old people and remains frequent in kids and adults (Eriksen et al., 2002; Holick, 2007). Staying away from the sun can result low down of blood calcidiol (25-hydroxy-vitamin D) (Schoenmakers et al., 2008). Deficiency of vitamin $D_3$ consequences weaken bone mineralization and impairment of bone that directs to softening the bone (Grant et al., 2005). Hypovitaminosis of Vitamin D might be a peril factor for multiple sclerosis (Pierrot-Deseilligny et al., 2010). In broad-spectrum, vitamin D's role to trigger the inborn and reduce the adaptive immunity (Hewison, 2011). Deficiency of Vitamin D has been associated to enlarge danger of viral diseases, together with HIV and influenza (Beard et al., 2011). Hazard of tuberculosis may appear with low ranks of vitamin D (Nnoaham et al., 2008): and historically vitamin D was used as a curative substance (Luong et al., 2011). Moreover, vitamin D supplementation has been recommended in individuals with short of vitamin D, with supplementation they can get better muscle power; it is supposed that rise in quantity and size of fast twitch muscle fibers linked through supplementation of vitamin D (Ceglia et al., 2013). It has been observed that fast twitch fibers are main contributor for anaerobic activities and strength, and are engaged primarily to avert falls, linked to muscle power in the old age people (Ceglia et al., 2013). Even though there are uncertain data relating low down situation of vitamin D to asthma, there is dubious authentication to hold up an advantageous outcome from supplementation (Hart, 2012). Accordingly, supplementation of vitamin D is not at present suggested for treatment or avoidance of asthma (Paul et al., 2012). Sufficient quantity of vitamin D helps pregnant women for the duration of development and it may experience

positive effects on immune system; normally during pregnancy women do not get the suggested quantity of vitamin D. A supplementation test in pregnant women has established, vitamin $D_3$ dosage of 4000 IU resulted better to those with smaller quantity for attaining particular mark in blood levels (Wagner et al., 2012). During pregnancy decreased levels of vitamin D are linked with preeclampsia, small infants and gestational diabetes; however advantages of supplements are indistinct (Aghajafari et al., 2013). There is no clinically confirmed significant advantage of vitamin D has established as a treatment (Pozuelo-Moyano et al., 2013).

Deficiency of vitamin D is described as less than 50 nmol/L or 20 ng/mL, and scarcity level in between 20 - 32 ng/mL or 50 - 80 nmol/L where as optimum level is more than 40 ng/mL or 100 nmol/L (Willis et al., 2008). It is anticipated that the human body have a need of vitamin D 3000 to 5000 IU on a daily basis to congregate the requirements of body's all cells and tissues (Holick, 2005). Experts suggest more elevated preliminary dosages as well, if 25-hydroxy vitamin D levels start to deficient, variation ranges commencing 2000 - 200,000 IU, unless desired calcidiol standard is achieved, after that 1000 to 2000 IU on daily basis in favour of maintenance (Willis et al., 2008). In vitamin D supplementation it has been observed in this study that lower levels of concentrations come out with greater response, so, upcoming studies may discover further considerable results by separating subjects into groups on the basis of their baseline 25-hydroxy vitamin D levels (Close et al., 2013).

Maintenance of sufficient serum calcidiol can be achieved through manufacturing from disclosure to sunlight besides ingestion from daily food (Pittas et al., 2010). Evidence points out the production of vitamin D from sunlight contact is controlled by a pessimistic response ring that averts toxicity, however, since of uncertainty regarding the cancer threat from sunlight, the Institute of Medicine, USA, have not issued any recommendation for the sum of sun contact obligatory to congregate vitamin D synthesis provisions (Pittas et al., 2010).

In view of that, the recommended intake of vitamin D presume that no production take place and total vitamin D intake has to be accomplished from food choices, even though that will happen rarely in practice (Pittas et al., 2010). Additional health benefits of vitamin D supplement within the common people are unpredictable but evidence is there that its use prevent from rickets or osteomalacia (Pittas et al., 2010).

Particularly about skeletal muscle, it has long been implicit that patients suffering from osteomalacia resulting from insufficient intake of vitamin D in normal diet are often prone to proximate muscle weakness that is responsive to vitamin D supplementation which exhibit an associated skeletal muscle myopathy (Smith et al., 1967; Irani, 1976; Ziambaras et al., 1997; Al-Said et al., 2009).

Characteristically Vitamin D is considered as a crucial endocrine controller of bone health by means of its function in phosphate and calcium homeostasis (Anderson et al,. 2012). Nevertheless, innumerable non-skeletal effects of the steroid hormone are now recognized and are mainly imputable to the recognition of the vitamin D receptor in almost all tissues (Rosen et al., 2012) together with skeletal muscle (Srikuea et al., 2012). Genome-wide study implies that any enhancement in vitamin D position considerably have an effect on the appearance of a massive number of genes that encompass several biological functions (Hossein-nezhad et al., 2013).

More than 500 million years and persist in to the current, the process of cholecalciferol's photosynthesis through phytoplankton in the sea (for example Emiliania huxleyi and coccolithophore) has existed, while prehistoric vertebrates in the marine might soak up calcium into their skeletons from sea water and consume plankton loaded in cholecalciferol, without relying on plants; earth animals requisite an additional means to fulfill their cholecalciferol necessity for a calcium made skeleton; more than 350 million years, soil vertebrates generating their individual vitamin D (Holick, 2011).

Absorption of vitamin D in the body is carried in the blood supply to liver, wherever this is transformed as the prohormone called calcidiol, moving calcidiol might next be changed as calcitriol which is biologically lively type of cholecalciferol in the kidneys, next ultimate changing point in the kidney, where calcitriol (lively shape of cholecalciferol) is freely discharged in the blood flow; through strapping up

with vitamin D binding protein (VDBP): transporter protein in blood cells, $1,25(OH)_2D$ is carried to different aimed parts, apart from to the kidneys, in the immune system calcitriol is also manufactured by monocyte-macrophages, when produced by monocyte-macrophages, calcitriol proceeds in the vicinity as a cytokine, it helps in protecting the body next to microbial invaders by inspiring the inborn immune system (Adams et al., 2010).

Among the living animal, experimentations reveal that vitamin D dearth consequences in reduced strength (Pleasure et al., 1979). Scarcity of vitamin D is linked with skeletal muscle weakness (Bischoff et al., 1999; Grimaldi et al., 2013). Deficiency of vitamin D is associated with shrivel of type II skeletal muscle fibres (Yoshikawa et al., 1979; Boland, 1986). In adrenal medullary cells vitamin D raises appearance of the tyrosine hydroxylase gene, moreover it is implicated in the neurotrophic biosynthesis aspects, production of nitric oxide synthesis enzyme, and augmented concentration of glutathione (Puchacz et al., 1996). A committee of U.S. Institute of Medicine brought to conclusion that serum calcidiol level of 30 ng/mL is enviable for general health and bone; the reference intake of diet for cholecalciferol are selected through a periphery of security and exceed the aimed serum calcidiol concentration to guarantee that particular quantity of ingestion attain the optimal serum calcidiol concentration in approximately the entire people, this is presumed that no assistance to serum calcidiol concentration from sunlight disclosure furthermore the commendation are entirely pertinent to dark skin community or insignificant revelation to sunshine (Holick, 2006). Further than, stumpy serum calcidiol concentration has been connected with stumpy bone mineral density and falls (Cranney et al, 2007). Toxicity of vitamin D is unusual due to better tolerance and very rare chances of getting booster from supplementation or exposure to sun light (Holick, 2007). The verge for vitamin D perniciousness has not been set up; nevertheless, the bearable higher ingestion level is 4000 IU/day for ages 9–71 (Ross et al., 2011). Vitamin D perniciousness is not due to sunshine disclosure, but might be reason by supplementing through elevated dosage of vitamin D, fit adults can suffer of overt toxicity by constant ingestion of above than 1250 micrograms/day (50,000 IU) after a number of months as well as may augment serum calcidiol concentration to 150 ng/mL and higher (Holick, 2007). Leading specialists have asserted that ingestion of 10,000 IU on daily basis would get a lot of time or many years to obvious indications of toxicity (Cannell et al., 2008).

It is established that serum calcidiol concentrations more than 75 nmol/L (30 ng/mL) are not constantly allied by means of amplified advantages, Serum calcidiol elevation greater than 50 ng/mL (125 nmol/L) might reason in favor of apprehension; on other hand, the preferred assortment of serum calcidiol is amid 20 to 50 ng/mL (Ross et al., 2011). Manifestation of vitamin D receptor in adult skeletal muscle has been reported (Bischoff et al., 2001; Boland, 2011). However, a fresh study confronts this (Wang et al., 2011). Vitamin D is associated to a host of organic effects; it is structurally alike to that of typical steroid hormones and play role through a VDR (vitamin D receptor): which is choosy for 1,25dihydroxyvitamin D; in spite of the structural dissimilarity, vitamins D2 and D3 are assumed to generate indistinguishable biological responses (Jones, 2013). Vitamin D has to play role in skeletal muscle functioning though might be its effect is direct, indirect, or both remains disconcerted (Rosen et al., 2012; Girgis et al., 2013). Muscle cell maturation, repair, development, and mitochondrial function are different errands performed by Vitamin D in human body (Garcia et al., 2011; Srikuea et al., 2012; Sinha et al., 2013). Current substantiation identify that vitamin $D_3$ supplementation alleviate exercise incited skeletal muscle harm (Choi et al., 2013).

There has been greater than before understanding of the effect of vitamin D on morphology of muscle and role in recent decades, but this is not well acknowledged in the Sports Medicine scripts (Hamilton et al., 2010). In near the beginning $20^{th}$ century, coaches and athletes sensed that UV rays had an affirmative effect on physical performance and progressively more proof is mounting up to hold up this observation (Hamilton et al., 2010). Equally longitudinal and cross-sectional studies suggest to a purposeful function for vitamin D in muscle and more freshly the detection of the vitamin D receptor (VDR) in muscle tissue supply a mechanistic sort of the utility of vitamin D inside muscle (Hamilton et al., 2010). The detection

of broad genomic and non-genomic functions for vitamin D inside skeletal muscle has tinted the possible effect; vitamin D insufficiency might have together the injury risk and under-performance in players (Hamilton et al., 2010).

There is a significant role of Vitamin D in skeletal muscles, earlier documented for its special effects on bone; at present it is recognized that vitamin D has a much wider range of utility for muscle, research points out that vitamin D paucity is epidemic (Bartoszewska et al., 2010). Affected populace comprises of the young and otherwise healthy members of the inhabitants, as well as athletes, debate exists with reference to the quantity of supplementation necessary to overturn deficiency and the comparative outcome of such turnaround on general health (Bartoszewska et al., 2010). Though, equally surplus as well as a dearth in vitamin D emerges to become a reason of unusual performance and untimely aging (Tuohimaa et al., 2009). There is a lot of advertisement of vitamin D supplements on the cyber media and by other means in favor of their alleged anti-cancer qualities (Byers, 2010).

The effects of Vitamin $D_3$ on bone and muscle health are well described in above review which explains the importance of Vitamin $D_3$ in humans. Present work will embark upon studies the effects of Vitamin $D_3$ on female Weightlifting players of Pakistan regarding the impact of Calcidiol on their muscle and bone and strength with the measuring parameter of increase in their serum calcidiol level (ng/ml) and best lifting total (Kgs). Vitamin D insufficiency is frequent in athletes especially in power sports. For sportsmen showing with stress fractures, musculoskeletal pain, and frequent illness, one should have a better knowledge of the further possible diagnosis of vitamin D deficiency. This research will show that how improvement in serum calcidiol level can be managed by uniform and supervised oral supplementation procedure which may produce momentous musculoskeletal sports fitness benefits. It is pertinent to mention that there is no research study is available regarding Alfacalcidol supplementation usage in female weightlifters.

**Research Objectives**

- Present work, regarding effect of Vitamin D on bone and muscle health of female Weightlifters which is helpful in reducing the risk of bone and muscle injuries among female weightlifters of Pakistan and outer world.
- Female Weightlifting Players having bone and muscle injuries so they are advised to check their Serum Calcidiol levels for the recommendation of supplements if needed.
- Prior knowledge about Serum Calcidiol level is of great value regarding its role in female athlete's bone and muscle health.

**Research Procedure**

- Collection of adequate numbers of female Weightlifting players.
- Selection of required numbers of players from Weightlifting with recommended inclusion criteria.
- Development of pre test analysis on behalf of serum calcidiol level (ng/ml) of players.
- Designing of a general training program according to serum calcidiol level / vitamin D deficiency of players.
- Development of post test analysis on behalf of serum calcidiol level of players.

**Research Question**

- What is the effect of Alfacalcidol supplementation on the strength of Female Weightlifters?

**Research Hypothesis**

- There will be an increase in the strength of Female Weightlifters due to Alfacalcidol supplement.

**Research Methodology**

**Subject Selection**

- Elite class female weightlifters (n=150) of age between 19 - 28 years and body weight from 45 to 76kg were selected from different weightlifting, powerlifting and bodybuilding clubs of Lahore, Gujranwala, Sialkot and Faisalabad. Their consent to participate in this study was taken on consent form by giving personal data, oral intake of Alfacalcidol and provision of blood sample after approval of this research protocol from the University's ethical committee.

**Research Design**

- As pre test analysis, data of all these players collected and recorded with key features of their name, age, body weight, body weight class, sports, lifting best total in weightlifting events (Snatch + Clean and Jerk) (International Weightlifting Federation, www.iwf.net, retrieved 2025-01-01) along with serum calcidiol level (ng/ml).

**Calcidiol Measurement Protocol**

- Serum calcidiol level of all players was done by using LIAISON® 25 OH Vitamin D Total (Kit No. 310600) through Liquid Chromatography-tandem Mass Spectrometry (LC-MS/MS) methods (Emmen et al., 2012).

**Categorization / Grouping**

- Based on their serum calcidiol level (nmol/L): All the players were divided into three groups named as Group A (Serum Calcidiol level below 50 nmol/L or 20 ng/mL called deficient): Group B (Serum Calcidiol level between 51-80 nmol/L or 20-32 ng/mL called insufficient) (Willis et al., 2008; Lasson-Mayer and Willis, 2010) and Group C (Serum Calcidiol level above than 100-250 nmol/L or 40-100 ng/mL called optimal) (Hollis, 2005; Cannell and Hollis, 2008) from female Weightlifting players.
- A separate but generalized (for all players) game specific training program for Weightlifting was developed according to their lifting best total (Kgs).
- All three groups were treated with once daily oral dose of Tab. Cadla (A product of Macter (Pvt.) Ltd.) containing 0.5mcg of Alfacalcidol (Holick, 2007) according to deficiency (Willis et al., 2008; Lasson-Mayer and Willis, 2010) under the supervision of a registered medical practitioner, pharmacist and other paramedical staff by observing all ethical aspects.

**Post Test (Mid Term)**

- After two months treatment, a post test (Mid Term) of best lifting total was checked and recorded.
- A comparative study was done on behalf of
    - Improvement in best lifting total from pre test to post test (Mid Term).
    - Improvement in serum calcidiol level from pre test to post test (Mid Term).
- A statistical analysis between change in serum calcidiol level and performance improvement was evaluated by using SPSS latest version (2022) officially named IBM SPSS statistics, which was used for all statistical analysis (Emma et al.,2024).

**Sub Grouping of Participants / Athletes**

- After Post Test (Mid Term) all three groups were divided into further two sub groups of each group as group A is divided into A1 and A2, group B is divided into B1 and B2 and group C is divided into C1 and C2 according to the deficiency (Willis et al., 2008; Lasson-Mayer and Willis, 2010).
- Then A1, B1 and C1 were again treated with once daily oral dose of 0.5mcg of Alfacalcidol and group A2, B2 and C2 were treated with placebo.
- A separate but generalized (for all players) game specific training program for Weightlifting was developed according to their best total.
- After two months treatment, a post test (Final Term) of best lifting total was checked and recorded. A post test (Final Term) of serum calcidiol level was done by using LIAISON® 25 OH Vitamin D Total (Kit No. 310600) through Liquid Chromatography-tandem Mass Spectrometry (LC-

MS/MS) methods (Emmen et al., 2012) through a patent pathological laboratory of Lahore, Pakistan and recorded containing columns Player Name, serum calcidiol level and lifting best total.

- A comparative analysis was done on behalf of improvement in best lifting total from pre test to post test (Final Term) and same comparative study of serum calcidiol level was also done from pre test and post test (Mid Term).

**Data Analysis of Research**

A statistical analysis between change in serum calcidiol level and performance improvement was be evaluated by using SPSS latest version (22) officially named IBM SPSS statistics (Emma et al., 2024). Paired sample t-test was used to measure the mean change in serum calcidiol level and mean change in best weightlifting capacity of players.

**Paired Sample T-Test for Female Weightlifters**

A paired sample t-test was applied to every participant of all three groups of female players for weightlifting regarding their serum calcidiol level (ng/ml) and best lifting record (Kgs) to see the mean change in the best lifting total and their serum calcidiol level. The outcomes showed that there was a considerable increment in serum calcidiol level (ng/ml) of pre-test and post-test (mid-term) when supplement (Cadla 0.5mcg) was given to the examined female weightlifters for a period of 60 days on each of the three groups A, B and C. After post-test (mid-term) all three groups were sub-divided as Group A is segregated A1 and A2, Group B is segregated in B1 and B2 and Group C is segregated as C1 and C2 from which A1, B1 and C1 were again treated with Cadla 0.5mcg for an additional two months while Placebo treatment was given to the A2, B2 and C2. A noticeable change/increase in mean serum calcidiol level and mean best lifting total was found in A1, B1 and C1 after post-test (final-term) compared to post-test (final-term) by measuring through paired sample t-test. Essentially, the best lifting total of female weightlifting players was likewise escalated in Groups A1, B1 and C1 because paired Sample t-test showed a significant difference ($P<0.5$) between the outcomes of post-test (Mid-term) and post-test (Final-term). Groups A2, B2 and C2, which were treated with a placebo treatment for two months, showed that there was no noticeable change ($P\geq0.5$) in serum calcidiol level of these groups regarding their Post-test (mid-term) results; the equivalent was the situation with the best lifting total of these group, paired sample t-test showed that there was noteworthy difference ($P\geq0.5$) between best lifting total of groups A2, B2 and C2 concerning their post-test (Mid-term) results (As shown in Table 1 and Table 2).

**Table 1:** Showing Paired Sample T-test outcomes of serum calcidiol level (ng/ml) of female weightlifting players of Group A (A1, A2), B (B1, B2) and C (C1, C2) for Mean and ±S.E. of Mean at three levels, as Pre-test, Post-test (Mid-term) and Post-test (Final-term). P is represented by * and **.

| Groups | Time Period: Treatment | Tests: n | Serum Calcidiol Level Mean (ng/ml) | ±S.E. Mean | Correlation ($r^2$) | t-value | p-value |
|---|---|---|---|---|---|---|---|
| A | | Pre-test: 90 | 15.90 | .40 | .84 | 36.38 | P<.001* |
| | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 90 | 24.74 | .44 | | | |
| A1 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 50 | 22.71 | .61 | .98 | 34.44 | |
| | Next 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Final-test):50 | 28.83 | .73 | | | |
| A2 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-test): 40 | 27.13 | .19 | .97 | .582 | .565** |

| Groups | Time Period: Treatment | Tests: n | Serum Calcidiol Level Mean (ng/ml) | ±S.E. Mean | Correlation ($r^2$) | t-value | p-value |
|---|---|---|---|---|---|---|---|
| A | | Pre-test: 90 | 15.90 | .40 | .84 | 36.38 | P<.001* |
| | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 90 | 24.74 | .44 | | | |
| A1 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 50 | 22.71 | .61 | .98 | 34.44 | |
| | Next 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Final-test):50 | 28.83 | .73 | | | |
| | Next 8 Weeks: Placebo | Post-test (Final-term):40 | 27.10 | .19 | | | |
| B | | Pre-test: 40 | 24.32 | .55 | .95 | 33.97 | P<.001* |
| | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-test): 40 | 30.42 | .57 | | | |
| B1 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-test): 22 | 28.10 | .28 | .91 | 40.46 | |
| | Next 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Final-test): 22 | 35.29 | .39 | | | |
| B2 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-test): 10 | 32.60 | .76 | .99 | 3.18 | .006* |
| | Next 8 Weeks: Placebo | Post-test (Final-term): 18 | 32.34 | .74 | | | |
| C | | Pre-test: 20 | 33.61 | .20 | .11 | 10.37 | P<.001* |
| | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 20 | 40.43 | .64 | | | |
| C1 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 13 | 40.90 | .88 | .98 | 25.87 | |
| | Next 8 Weeks: T ab. Cadla 0.5 mcg/day | Post-test (Final-term): 13 | 47.09 | .70 | | | |
| C2 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 7 | 39.48 | .53 | .94 | 12.27 | .052** |
| | Next 8 Weeks: Placebo | Post-test (Final-term): 7 | 38.81 | .48 | | | |

***P<.05, **P>.05**

**Table 2:** Showing Paired Sample T-test outcomes of Best Lifting Record (Kgs) of weightlifting players of Group A (A1, A2), B (B1, B2) and C (C1, C2) for Mean and ±S.E. of Mean at three levels, as Pre-assessment, Post-assessment (Mid-tenure) and Post-assessment (Final-tenure). P is represented by * and **.

| Groups | Time Period: Treatment | Tests: n | Best Lifting Record Mean (Kg) | ± S.E. Mean | Correlation ($r^2$) | t-value | p-value |
|---|---|---|---|---|---|---|---|
| A | | Pre-test: 90 | 199.19 | 3.37 | .99 | 59.33 | P<.001* |
| | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 90 | 210.83 | 2.42 | | | |
| A1 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 50 | 206.21 | 3.98 | 1.00 | 58.21 | |
| | Next 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Final-test):50 | 212.06 | 4.01 | | | |
| A2 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-test): 40 | 215.46 | 3.95 | .99 | .38 | .68** |
| | Next 8 Weeks: Placebo | Post-test (Final-term):40 | 215.57 | 4.02 | | | |
| B | | Pre-test: 40 | 198.31 | 4.03 | .99 | 58.92 | P<.001* |
| | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-tets (Mid-test): 40 | 212.13 | 4.11 | | | |
| B1 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-test): 22 | 212.07 | 4.41 | 1.00 | 29.77 | |
| | Next 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Final-test): 22 | 217.86 | 4.49 | | | |
| B2 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-test): 10 | 208.20 | 4.89 | .99 | 3.34 | .041* |
| | Next 8 Weeks: Placebo | Post-test (Final-term): 18 | 208.60 | 4.91 | | | |
| C | | Pre-test: 20 | 217.90 | 2.41 | .99 | 62.22 | P<.001* |
| | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 20 | 225.40 | 2.53 | | | |
| C1 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 13 | 227.60 | 4.03 | 1.00 | 22.99 | |
| | Next 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Final-term): 13 | 232.80 | 4.01 | | | |
| C2 | First 8 Weeks: Tab. Cadla 0.5 mcg/day | Post-test (Mid-term): 7 | 223.20 | .98 | .99 | 4.93 | .126** |
| | Next 8 Weeks: Placebo | Post-test (Final-term): 7 | 222.60 | .99 | | | |

***P<.05, **P>.05**

**Discussion**

It is a matter of concern for the professionals in general and the sportsmen in particular that they should remain healthy and maintain their health. It is commonly observed that the general masses become vitamin D deficient because of varied reasons; the sportsmen are no exception to it the data to this effect in

particular reference to Pakistan is not available. Each and every sport calls for certain pre requisite as well as the supporting elements. Psychologically the sportsmen feel relaxed, competent in discipline and handle the performance by acting out and not by self reflection. They don't lose heart and keep on taking risk to improve even in their personal record. The term concentration applies to the weightlifter even; they concentrate in the second or third lift by visualizing and psyching up. Their repetition, make them learn to like the sport, and compromise the training to heel up their pulled muscles. The weightlifters are to be patient, stick to their sport and keep on repeating. All these qualities can be inculcated into the sportsmen related to weightlifting but the vitamin D level plays a vital role. That is required to be continuously checked to avoid any hazard.

Studies support the findings that Tab. Cadla 0.5 mcg on once daily influences muscle strength and balance (Wicherts et al., 2007). serum 25(OH)D lower than 50 nmol/L is associated with lower physical performance (Sohl et al., 2013). Supplementation with Tab. Cadla 0.5 mcg for 4 months in older mobility-limited women with moderately low vitamin D status increased intramyonuclear VDR concentration and muscle fiber size (Ceglia et al., 2013). Vitamin D supplement of 800IU per day in combination with calcium may reduce the incidence of non-vertebral fractures by about 10–20% in an old, vitamin D deficient population (Lips, Gielen, & van Schoor, 2014). There are certain studies that tell us that provision of vitamin D enhances the participatory life of the sportsmen. The association between low serum 25(OH)D concentration and low physical performance therefore remains mainly uncertain for muscle strength (Annweiler, Schott, Berrut, Fantino, & Beauchet, 2009). Vitamin D together with Calcium is recommended as a basic therapy for all forms of osteoporosis, i.e. should be given together with any specific medication (Ringe, 2012). There is little scientific evidence that vitamin D supplementation improves performance in athletes that are not vitamin D deficient. Nonetheless, based upon the evidence that many athletic populations are vitamin D deficient or insufficient, it is recommended that athletes monitor their serum vitamin D concentration and consult with their health care professional and/or nutritionist to determine if they would derive health benefits from vitamin D supplementation (Powers, Nelson, & Larson-Meyer, 2011).

**Conclusions**

The following are the conclusions;

- The increase in calcidiol level was recorded at the pre test, post-test (mid-term) and post-test (Final term). That serves as a proof that the provision of Tab. Cadla 0.5mcg supplement, showed a marked change not only in the increase in serum calcidiol level, but that of bone and muscle health also because it serves as a prerequisite for it.
- At the second level it was observed that sportswomen performance increased in the weightlifting with the provision of Tab. Cadla 0.5mcg supplement.
- It was also divulged that the performance increased in the overall lifting with the provision of Tab. Cadla 0.5mcg supplement.

**Recommendations**

- It is recommended that there should be a regular physical examination for serum calcidiol level and supplement be provided under the supervision of a professional medical practitioner and follow up of the same be done as a regular feature.
- Bone and muscle health tests should be continuously conducted for the ease and best performance of the sports person.
- Training be managed as regular feature in view of the needs both pathological and professional skills as well as the safety of the bone and muscle health of the sports person.

- It is further recommended that the sports persons be exposed to the films shows, talk shows and open houses to make necessary consultation for the maintenance of the bone and muscle health as well as the performance of the sport.

**Suggestions**

- All the Weightlifters should be checked for Serum Calcidiol status before joining Weightlifting sport.
- All Senior women weightlifting players should be monitored at least twice a year for their serum calcidiol level.
- There should be more focus on young athletes (age b/w 12 - 20 years) for their Vitamin D supplementation for better bone and muscle growth.
- There should be a Vitamin D supplementation awareness program for clubs and players governed by National Federations / National Olympic Committee and Sports Board at least once in a year for better outcomes and preventive measures from Injuries in Weightlifting sport.
- There should be subsidized rates for Serum Calcidiol Test for Weightlifters and all other strength sports persons where Vitamin D has its vital role in their Sports.
- As women Weightlifting is increasing day by day so there should be free supplementation arranged by National Federations for female players at the venue of National, Provincial Championships.
- Old age / Retired Players of Weightlifting should also be taken into consideration for proper Vitamin D Supplementation.

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