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**ORIGINAL ARTICLE**

# Is Vitamin D Testing in the Hospitals of Peshawar Consistent with Guideline Recommendations?

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## ABSTRACT

Vitamin D is a prohormone that has been shown to impact immune response and is well-known for its role in bone health. An expanding body of evidence suggests that 25OHD testing is being misused, which causes a heavy burden on the healthcare system. Analysis of all serum 25OHD tests given to adult inpatients and outpatients from January 1, 2022 through March 1, 2022. It was determined that a total of 189 tests were conducted during the audit period of one week. There were 130 preliminary examinations, 40 of which were conducted on individuals already receiving vitamin D supplementation. The number of people who had a valid reason to get tested (55) was significantly higher than those who did not (23). Fifty-one percent of the 183 25OHD tests were unnecessary. A reduction in testing may be possible if current recommendations are strictly adhered to. Only 3% of individuals with vitamin D deficiency were tested for celiac disease within nine months. Significant cost savings are achieved without compromising patient outcomes by increasing compliance with guide suggestions for 25 hydroxyvitamin D testing, utilization of test data, and implementation of recent reasons for examination. Possible causes of unneeded retesting include the lack of usage of electronic records and inadequate communication between doctors. It is possible that outcomes are not being actively studied due to a lack of distinguishable follow-up testing for vitamin D-related disorders.

## INTRODUCTION

The prohormone vitamin D is highly recognized for its starring role in maintaining healthy bones, but it also regulates the body's immunological response. People all across the world suffer from vitamin D shortage. This condition is more frequent in the elderly (1). Diseases including asthma and bronchitis, rickets and osteomalacia, broken bones, and diabetes are all linked to vitamin D deficiency. Many people are interested in quick and simple ways to check their Vitamin D level because of its importance in bone calcification and development (2).

Vitamin D inadequacy has been correlated to a wide variety of disorders in several studies. However, these findings may be challenging to interpret due to residual confounding and reverse causality (3). Evidence from randomized controlled trials has failed to show that supplementing with vitamin D can inhibit or lessen the severity of several extra-skeletal disorders, suggesting that low blood 25-hydroxyvitamin D (25OHD) may instead be a sign of poor physical condition (4). There is mounting proof that unwarranted 25OHD testing puts undue strain on the healthcare system. Overdiagnosis occurs when patients who do not have the disease are diagnosed directly related to the overuse or misuse of laboratory testing (5).

Given the elevated number of publications about vitamin D shortage in current years (over 4000 in 2013 alone) and the enormous number of current regulations on the matter, which make seemingly different views, the rise in test numbers may not come as a complete surprise. However, given the ongoing research into vitamin D deficiency's potential role as a risk factor for numerous diseases, clinicians may feel more comfortable using broad principles than narrow guideline sanctions when gauging serum 25OHD, foremost to a 'leak' in the medical suggestions for testing and an increase in the number of tests performed (6). This audit aimed to determine if our tertiary referral hospital followed recommended guidelines for 25OHD testing in terms of clinical criteria, frequency of testing, and usage of test results.

## METHODOLOGY

We examined the most relevant national and international guidelines on vitamin D insufficiency and 25OHD testing published in 2015. The Study was Conducted in Pak International Medical College Hayatabad ,Peshawar.According to international and Pakistani guidelines, serum 25-hydroxyvitamin D (25OHD) levels below 50 nmol/L at the end of winter indicate vitamin D deficiency, and retesting should be done no sooner than ninety days later starting vitamin D therapy. Importantly, in December 2018, Medicare Pakistan accepted clinical indications for testing to limit 25OHD testing (7).

In addition, three critical worldwide guidelines for treating vitamin D deficiency and osteoporosis were published last year. Patients with situations that have a recognized physiological device for decreased vitamin D amalgamation or improved catabolism are typically included in at-risk populations; however, this does not apply to situations where there is no straight indication of fundamental link to vitamin D deficiency or help from vitamin D supplementation (8).

The current study's risk variables and medical concerns are consistent with 'guideline-supported' criteria for 25OHD testing, and the recommendations assessed were those for patients in tertiary care facilities. Crohn's disease, bariatric surgery, lingering diarrhea, cystic fibrosis, celiac disease, enduring kidney syndrome (Stage 3-5 CKD or nephrotic range protein), and institutional living were all included. In addition, we allowed testing for an additional guideline-supported clinical indication in patients who were already getting vitamin D supplements or proof that testing was being done to monitor supplement response (9).

Although disease-specific guidelines urge treating the deficiency in vitamin D as if it were a general population disease, the adoption of annual repeat screening of CKD patients, with or without vitamin D medication, was based on the progressive and dynamic nature of CKD-related mineral and bone problems. Obesity was excluded from the analysis due to new research suggesting that low serum 25OHD in obese patients is more likely an outcome of illness rather than a cause of it. We included non-recommended indications in our data when they were mentioned as the primary reason for testing. All serum 25OHD readings (including those requested at the local and regional levels) taken on adult inpatients and outpatients from January 1, 2022, to March 1, 2022,inclusive, were thoroughly evaluated as part of an audit undertaken at a tertiary referral hospital.

We examined lab requests to determine why clinicians ordered serum 25OHD tests. We examined paper and electronic medical records to determine whether there were any more likely clinical reasons for vitamin D testing, prior test results, or follow-up treatment recommendations. Even if it was not explicitly specified, 25OHD testing might be done for any clinically relevant, guideline-

supported cause listed in the patient's medical records. When several testing indications were discovered, the most pertinent one was identified; the most vital was the avoidance of osteoporotic fractures and falls and the evaluation of supplement response (10).

To reduce the influence of auditor prejudice, we embraced a broad view of testing justification. A first-time test was determined by the absence of earlier serum 25OHD test findings within the previous six months. If recommendations supported a clinical indication, or if the test was accomplished to measure response to subjoining for patients before now on vitamin D, the test was deemed consistent with guidelines, and the result was used correctly. The results were considered suitable and compatible with the guidelines if the new test was performed additional than 90 days after the preceding test, for a further guideline-supported suggestion, or to monitor response to vitamin D treatment.

A practical application of the findings was changing or maintaining vitamin D intake in response to test results. To evaluate the cause or effect of deficiency of vitamin D, additional laboratory tests (such as renal function, serum calcium, parathyroid hormone, and celiac serology) and bone density examinations were done. Throughout the auditing period, serum 25OHD levels were assessed using the Architect 25OHD chemiluminescent microparticle immunoassay.

The existence of moderate/severe dearth of vitamin D (classified as 25OHD 150 nmol/L) was confirmed by internal liquid chromatography-tandem mass spectrometry. In most cases, immunoassay results were available in less than three days; however, waiting for LC-MSMS results could extend that to seven days. If an LC-MSMS test result were still waiting, the laboratory would issue a report that clinicians could view online while they waited. Between repeated measurements, the Architect immunoassay method showed a CV of 10% at 30 nmol/L, 8.7% at 58 nmol/L, and 8.4% at 140 nmol/L. The inter-assay CV for the LC-MSMS technique was 7% at 23 nmol/L, 5% at 68 nmol/L, and 5% at 189 nmol/L.

## RESULTS

Of the 189 tests conducted throughout the audit period (January 1, 2021, through January 7, 2021, inclusive), six could not be fully analysed due to a deficiency of patient clinical information. The median age of the 183 contestants in the audit sample was 65 years old, and 60% were women; the median serum 25OHD concentration was 65 nmol/L, and 15% of the results were positive. Forty of the 130 preliminary experiments were conducted on people who were already taking vitamin D supplements, and another 25 were deemed to be at least somewhat supportive by guidelines. Among these were ten tests on people who already had diabetes, four on supplement response, four on patients with compromised immune systems, and five on those with chronic kidney disease. In contrast, there were 9 tests where neither the rationale nor the explanation could be traced back to any specific guidelines.

Only 55 of the 83 people who did not take vitamin D supplements had a reason that followed the guidelines for testing, while the remaining 23 did not. Out of 87 tests recommended by the guidelines, 23 returned a low result, although only 11 were initiated or increased. Therefore, only 80 of the primary tests performed had an indication supported by the guidelines and were used appropriately.

The majority (47/100) of the retests were performed within three months after the prior test; nevertheless, only 25% of the retests were performed beyond the recommended retesting interval. Five were for a new guideline-supported suggestion, three were for testing response to supplementation, and one was part of a clinical study protocol; the remaining nine were in patients with acceptable serum 25OHD (53 nmol/L) within the preceding year. It is considered that six of the preceding thirteen tests in patients with low 25OHD were dedicated to assessing response to supplementation because they were administered to individuals who were already taking vitamin D. All the same, five of them were done on people who weren't taking vitamin D and hadn't presented any new symptoms to warrant a checkup.

Of the total of 183 tests, 77 (41% of the total) had an indication supported by guidelines listed on the laboratory request form, whereas the remaining tests were ordered for a wide range of reasons that were not covered by the guidelines. A additional 55 (31%) tests were found to have a reason in conformity with guidelines after a careful review of the clinical records. Because only 47 of the cases, or 26% of the total, had documented follow-up plans in the clinical notes for additional blood tests, bone density testing, or alternative treatment options, the assessment of whether the 25OHD test consequences were suitably utilized was inadequate to whether or not vitamin D subjunction was began or increased after a low impact. Despite the difficulty of analysing purposely related laboratory testing, testing for parathyroid hormone, electrolytes, and corrected blood calcium was performed in 61, 147, and 144 individuals, respectively, within six days following vitamin D tests. This was done six days after the vitamin D testing. Only three of the thirty-one patients with vitamin D deficiency were tested for celiac serology within nine months after being diagnosed with vitamin D deficiency.

## DISCUSSION

The majority (94/183) of the 183 serum 25OHD tests conducted during the audit period followed recommended procedures and used the results correctly. This shows that as many as half of the current 25OHD screenings could be pointless. Patient outcomes and the quantity of 25OHD tests ordered should benefit from stricter adherence to existing guideline criteria. Over-diagnosis is possible if researchers misinterpret or over-extrapolate data relating low serum 25OHD to various disease states (skeletal and extra-skeletal) across multiple patient populations, especially when there is a wealth of literature but no evidence from randomised clinical trials. The core focuses of these guidelines are bone health, osteoporosis prevention, and diabetes prevention; however, certain disease-specific recommendations are based on weaker evidence for potential benefit on other non-skeletal outcomes (e.g., immune function, disease activity).

The high rate of potentially needless repeat 25OHD testing is alarming because most requesting clinicians in hospitals have electronic and telephone access to the pathology results database showing all previous and current requests and findings. Retesting may be unneeded if electronic health records are underutilized and physicians participating in the patient's treatment fail to effectively communicate with one another by documenting management plans and test findings. Because of the public's interest in vitamin D deficiency and potentially an underestimation of the limitations of current data, 25OHD testing has become unjustifiably "normal" for various patient groups, with a considerable percentage of tests performed outside of guideline guidelines. Results may not be adequately considered or utilized for many patients, as indicated by the absence of apparent follow-up testing for conditions related with VDD in this study.

Table 1: Vitamin D testing diagnoses in the audit sample (n = 183)

| S.No. | Category | From the laboratory request form |
|---|---|---|
| 1 | Guideline supported indication for testing identified | 83 |
| 1a | Diabetes | 25 |
| 1b | Chronic kidney disease | 20 |
| 1c | Ethnicity risk | 17 |
| 1d | Hepatic failure | 14 |
| 1e | Infection | 3 |
| 1f | Medication | 4 |
| 2 | No reason identified | 46 |
| 3 | Non-guideline indication for testing identified | 54 |
| 3a | Obesity | 23 |
| 3b | Autoimmune disease | 9 |
| 3c | Diseases related to neurons | 6 |
| 3d | Miscellaneous | 16 |

This audit's retrospective design allows for a more realistic picture of 25OHD testing in ordinary clinical practice without putting clinicians at danger of altering their behavior by being observed. We were generous when assigning indications to the 25OHD tests recommended by the guidelines so as not to understate the extent to which their use was adopted. Due to a lack of documentation, we were unable to reliably identify the rationale utilized for serum 25OHD measurement in some circumstances, making it impossible for us to evaluate whether or not the test result was used appropriately (for both initial and repeat tests). Given that we did not examine 25OHD testing performed by other private laboratories or in the primary care environment, the true number of tests that may be unnecessary is likely much greater.

## CONCLUSION

Vitamin D, a prohormone, is extensively acknowledged for its importance to bone health and has also been proven to affect the immunological response. More and more data suggests that 25-hydroxyvitamin D testing is being overused, placing an unnecessary strain on the healthcare system. Due to the high volume of 25 hydroxyvitamin D (25(OH)D) tests being performed, unnecessary testing and retesting of patients are unnecessary testing. Authors believe that reducing costs can be done without sacrificing patient outcomes by boosting compliance and enforcement of new reasons for testing. They suggest that we may save much money by cutting down on unnecessary tests. It is necessary to conduct additional qualitative research into the causes of unnecessary testing and retesting.

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