Role of Vitamin D from sun in breast cancer Prevention

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For our vitamin-D needs the solar ultraviolet B photons (290-315 nm) penetrates into the skin where they cause the photolysis of 7-dehydrocholesterol to precholecalciferol. Once formed, precholecalciferol undergoes a thermally induced rearrangement of its double bonds to form cholecalciferol.The majority of South Asians never reached sufficiency in vitamin D status. Lifestyle differences, with lower oral intake, sun exposure and rates of cutaneous production due to darker skin, indicate that standard advice on obtaining sufficient vitamin D needs modification for the South Asian community. This becomes more important when required for cancer prevention.

In view of ample evidences,[1-6] of protective role of sun exposure especially in breast cancer as it raises vitamin D leve[7], It is felt that there is need that it be highlighted in cancer preventionguidelines. There is need to generate country/region specific data also to document quantitative narration ontime and type of sun exposure for cancer prevention. Serum vitamin D status of American people using data of National Health and Nutrition Examination Survey 2012 in USA(NHANES)[8]reported serum 25 (OH) D among 20-49 yrs age group (n=5454) 62.06±0.84 nmol/L, higher than average 25nmol/L in south Asian population in this report. Some of the reasons for low vitamin D are old age, female gender, high altitude, dark skin, less sun light, dietary habits and absence of vitamin D in diet.

Indian socio-religious practices have not been facilitating for adequate sun exposure hencemany diseases attributed to be increased. There is increasing prevalence of rickets, osteoporosis, cardiovascular diseases, diabetes, and infection such as tuberculosis is increasing apart from cancers specially breast cancer in India. Genes of breast cancer are closely linked to vitamin D receptor gene (VDR) and have been reported to be affecting breast cancer occurrence if vitamin D is low[9]. Sun energy for vitamin D has been reportedto be more efficient than dietary vitamin D supplement[10]. It is cost effective, safer,availableand logistically feasible in Indian conditions. Hence should bemandatorypart of cancer prevention guidelines, atleast in tropical regions where sun exposure does not lead to increased risk of skin cancer as happens in Mediterranean regions[11].

Multi-level modelinghavesuggested that, in comparison to sun exposure (1.59, 95 %CI□=□0.83-2.35), dietary intake of vitamin D had no impact on 25(OH)D levels (-0.08, 95 %CI□=□-1.39 to 1.23). Hence there is need for community based data generation for specific quantity of sun and time as per geographical location[12]. Chart of region specific timing as per quality of sun rays in that particular region and season would help community to follow cancer protective life style. This model[13] (as done by Webb et al) have not been included in cancer preventing guidelineswhile it can be life savingand combat rising trends of breast cancer in India. At present sun exposure has not been included in cancer prevention guidelines of India since guidelines are made on the basis of research mostly done outside India.

Despite reassuring studies, the public health and medical communities have not adopted use ofsunlight for vitamin D hence cancer prevention[14]. Hence this low cost, effective and minimal or low side effect measure required to be highlighted and this education should reach to the community for cancer prevention.

Breast cancer prevention guidelinesWorldwide (including India, viz. http://cancerindia.org.in/cp/images/PDF/Operational_Framework_Management_of_Common_Cancers.pdf, as accessed on 7/12/2016) recommendedincreased physical activity, weight control, healthy diet, use of tamoxifen, bilateral salpingo-ophorectomy and mastectomy in high risk cases after completing family. These may provide 50% reduction of breast cancer occurrence. However guidelinesnowhere included sun exposure for cancer prevention while it has also been reported to prevent breast cancer by 50%. For Mediterranean regions,Sun exposure may not be safe after certain limits however such is not the risk with tropical regions. Still tropical countries have not modified their cancer prevention guidelines.

Plenty research[15]have documented 30-50% increased cancer risk if vitamin D levels are below 20 ng/ml.This review provides comprehensive overviewon how this effective preventive strategy is ignored in absence of data on region specific prevention guidelines. American researchers identified 190 women with incident breast cancer from a cohort of 5009 white women who completed the dermatological examination and 24-h dietary recall conducted from 1971–1974 and who were followed up to 1992. Measures of sunlight exposure and dietary vitamin D intake were found to be associated with reduced risk of breast cancer, with RRs ranging from 0.67–0.85. The associations with sun exposures, however, varied by region of residence. The risk reductions were highest for women who lived in United States regions of high solar radiation, with RRs ranging from 0.35–0.75. No reductions in risk were found for women who lived in regions of low solar radiation[16].

According to one pooled analysis, individuals with serum 25(OH)D of approximately 52 ng/ml had 50% lower risk of breast cancer than those with serum <13 ng/ml. This serum level corresponds to intake of oral 4000 IU/day. This exceeds the National Academy of Sciences upper limit of 2000 IU/day. A 25(OH)D level of 52 ng/ml could be maintained by intake of 2000 IU/day and, when appropriated, about 12 min/day in the sun(which is equivalent to oral intake of 3000 IU of Vitamin D_3)was considered as another alternative[17].Again there are controversies on time and amount of exposure that how the incident sunrays should fall on the earth in different geographical regions and what is the color of the skin etc.

For people of South Asian ethnicity living at latitudes distant from the equator, specific sun-exposure guidance is given in one study -ie, equivalent to 45 min unshaded noontime exposure 3 times/wk, with 35% skin surface area exposed) can help achieve a vitamin D status >10 ng 25(OH)D/mL [mean: 15 ng 25(OH)D/mL]. Studies on dietary/ supplementary strategies in attempts to reach concentrations ≥20 ng/mL have been in plenty. There has been a paucity of information regarding the effect of controlled UV exposures/ sun rays on 25(OH)D production in South Asians condition[18]

One study done in USA[19] documented rising sun exposure time on vitamin D levels and reported that after threefold increasing dose of sun exposure - The application of doses ranging from 0.65 to 3.9 SEDs (sun exposure doses), equivalent to 15–90 min unshaded noontime summer sunlight exposure under a clear sky, significantly increased circulating 25(OH)D in all study groups, and 25% of individuals in the highest responding dose group attained concentrations ≥20 ng/mL

In Australia, Sun exposure is the cause of around 99% of non-melanoma skin cancers and 95% of melanomas[iv]. Hence their cancer prevention statement also contains guidelines to tell Australians on how much sun they need to avoid vitamin D deficiency and stay healthy without increasing their risk of skin cancer. Even during childhood sun exposure makes an important contribution to the lifetime risk of skin cancer. Hence cancer council has issued guidelines to avoid sun in Australian condition. Such is not the situation with tropical countries where high skin melanin sufficiently reduces that risk. However it warrants longer duration of exposure for same amount of vitamin D formation.

Clearly South Asian community with high skin melanin content and low risk of skin cancer, requires more time of sun exposure and region specific data.[20,21] It became more clear with study[22] reporting more specifically that midday exposures to summer sunlight at 53.5°N (1.3 SED- sun exposure diaries; 3 times/wk for 6 wk; 35% skin surface), produced vitamin D sufficiency [25(OH)D concentration ≥20 ng/mL] in 90% of white adults, but failed to produce sufficiency in any subject of South Asian ethnicity[23] The Flexible Spending Account (FSA)-funded research suggested that the typical daily intake of vitamin D from food contributed less than UVB exposure to average year-round 25OHD levels in both Caucasian and Asian women. A study from Hawaii, collected 100 cord plasma samples[24]from apparently healthy full-term newborns and their mothers. Results suggested that prenatal oral supplement of 400 IU vitamin D/day do

not protect against vitamin D deficiency, even in subjects living in the tropics where ample sun irradiance exists for cutaneous vitamin D synthesis. The reason was less sun exposure.

The need of the hour is to revise cancer prevention guidelines to include sun light as prevention measure, also generate region specific time and type of exposure to achieve average 20 ng/mL vitamin D concentration in blood.

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