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## Vitamin D state of Asians living in Pakistan

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### Abstract

Asians living in Pakistan have serum 25-hydroxycholecalciferol concentrations which are well within the normal range and significantly higher than in Asians resident in Britain. Clearly, Asians can maintain an adequate vitamin D state given an abundant supply of ultraviolet light, and the expression of vitamin D deficiency is an environmental and not a genetically determined characteristic.

The risk of an Asian developing vitamin D deficiency increases after migration to Britain. The most efficient way to treat this is by supplementation with vitamin D.

### Introduction

Asian immigrants to the United Kingdom are known to be at risk of developing osteomalacia or rickets.<sup>1</sup> The numbers developing clinical bone disease are relatively small,<sup>2</sup> but between 33% and 44% of Asian immigrants have biochemical evidence of vitamin D deficiency with low serum concentrations of 25-hydroxycholecalciferol<sup>3</sup> (25(OH)D). The aetiology of the

condition remains controversial and various environmental and genetic factors have been implicated. Inadequate habitual solar exposure, dietary practices, skin colour, and an entirely speculative "metabolic defect" have all been suggested. Despite this controversy there is very little information on the biochemical vitamin D state of Asians living in their home country, and such information might provide a valuable insight into the factors causing the low serum 25(OH)D concentrations among immigrants to Britain.

We have compared the vitamin D state of Pakistanis residing in Rochdale, Lancashire (latitude 53° 26'N), with that of a group of Pakistanis residing in the Punjab (roughly 29°N).

### Subjects and methods

Of the 262 Asians seen in a large survey of Rochdale Asians,<sup>2</sup> 90 hailed from the Lahore and Rawalpindi area of Pakistan. These subjects were interviewed by AR and TM and contact addresses of relatives in Pakistan obtained. During a subsequent visit to Pakistan in the summer of 1981 attempts were made to trace these relatives and to solicit their help with the study. In the event, 92 indigenous Pakistanis (48 male, 44 female) were investigated. Nineteen of these were first-degree relatives of immigrants to Britain, and the remaining 73 were recruited from among the neighbours of relatives declining to take part in the study. The median age of these subjects was 29 years. There was one 11-year-old, and the remainder ranged from 14 to 75 years. They were considered to be highly representative of the community from which the Asian immigrants to Britain had originated. Of the 92 subjects, 31 were villagers and 61 were city dwellers.

All participants in the study underwent venesection, and the frozen serum was returned to Manchester for measurement of the serum 25(OH)D concentration by competitive protein-binding assay.<sup>2</sup> Clinical evidence of vitamin D deficiency was sought by questioning and by examination, and a dietary history was taken by the seven-day recall method to ascertain the dietary intake of vitamin D.

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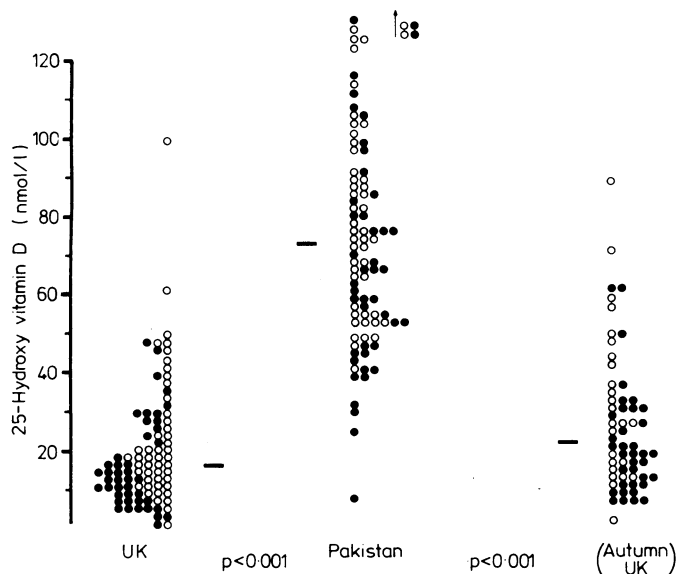
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In order to compare the biochemical profile of indigenous Pakistanis with that of migrants to Britain, 92 subjects identically matched for age and sex were selected from the group of Asians originally seen in Rochdale in the spring of 1980 and who are described in full elsewhere.<sup>2</sup> Forty-eight of these were male and 44 female, and their median age was 29 years (range 11-60). Since 25(OH)D concentrations fluctuate with season, however, it is not entirely valid to compare the summer 25(OH)D concentrations in Pakistan with the spring 25(OH)D concentrations in Rochdale. The serum 25(OH)D concentrations of indigenous Pakistanis were therefore also compared with those in 61 unmatched Rochdale Asians sampled in the Autumn of 1980. These comprised 25 male and 36 female subjects with a median age of 31 years (range 8-58).

Results are expressed either as mean  $\pm$  1 SD or as the median and range. Statistical analysis was by standard parametric and non-parametric tests. The food tables of McCance and Widdowson<sup>4</sup> were expanded by adding certain Asian recipes<sup>5</sup> and traditional local dishes—for example, goat curry, buffalo milk—to help in the dietary evaluation.

## Results

No subject seen in Pakistan had clinical evidence of vitamin D deficiency. The figure shows that the serum 25(OH)D concentrations in indigenous Pakistanis (median 74 nmol/l, range 7.5-157.5 nmol/l;



Serum 25-hydroxy vitamin D concentrations in group of Asians resident in Britain and group of age-matched and sex-matched Asians resident in Pakistan. For comparison, serum 25-hydroxy vitamin D concentrations shown for group of unmatched immigrant Asians sampled in autumn. Bars are median values. ○ = Males. ● = Females.

Conversion: SI to traditional units—25-Hydroxy vitamin D: 1 nmol/l  $\approx$  0.4 ng/ml.

29.7 ng/ml, 3.0-63.1 ng/ml) were significantly higher than in both age-matched and sex-matched migrant Asians in Britain sampled in the spring (median 16.5 nmol/l, range 1.5-100.0 nmol/l; 6.6 ng/ml, < 1.0-40.0 ng/ml) ( $p < 0.001$ ) and in unmatched migrant Asians sampled in the autumn (median 23 nmol/l, range 1.5-82.0 nmol/l; 9.2 ng/ml, 0.6-33.0 ng/ml) ( $p < 0.001$ ). Only one indigenous Pakistani had an abnormally low concentration (7.5 nmol/l; 3.0 ng/ml). She was a 24-year-old city dweller noted for strict observance of purdah and who described her occupation as "housework." Indigenous Pakistani women had lower serum 25(OH)D concentrations ( $67.3 \pm 28.3$  nmol/l;  $27.0 \pm 11.3$  ng/ml) than the men ( $82.3 \pm 27.5$  nmol/l;  $33.0 \pm 11.0$  ng/ml) ( $p < 0.02$ ). There was no significant difference in 25(OH)D concentrations between villagers and city dwellers.

The mean dietary intake of vitamin D was estimated as  $1.05 \pm 0.80$   $\mu$ g/day in Pakistan and  $2.67 \pm 2.00$   $\mu$ g/day in Britain. The form of the diet was essentially the same in the two countries.

## Discussion

It is clear from the results of the serum 25(OH)D estimations that the vitamin D state of the indigenous Pakistani population is generally excellent. This indicates that Asians, if given adequate solar exposure, can maintain high/normal serum 25(OH)D concentrations despite a very small dietary intake of vitamin D and the consumption of a wheat-based diet whose nature is considered by some investigators to be conducive to rickets.<sup>6</sup> The implication is that Pakistanis enter Britain in a vitamin D replete state, which is consistent with the finding of normal serum 25(OH)D concentrations in East African Asians on arrival in this country<sup>7</sup> and with the gradual fall in serum 25(OH)D concentrations seen during the first two years of domicile in Britain.<sup>8</sup> Studies examining the comparative serum calcium, phosphorus, and alkaline phosphatase values between migrant and indigenous Asians also show that the vitamin D state in the latter group is superior.<sup>9,10</sup> Furthermore, our results support the view that vitamin D deficiency among Asians in Britain is an expression of the environmental change consequent on migration and is not an intrinsic characteristic of Indian races.

The principal source of vitamin D is ultraviolet light, and several factors may be implicated in the causation of the lower 25(OH)D concentrations seen in migrant Asians. The move to a more northerly latitude will restrict the availability of ultraviolet light,<sup>11</sup> as will the greater cloud cover and air pollution in Britain.<sup>12</sup> The screening effect of pigmented skin may be more important when the supply of ultraviolet light is attenuated,<sup>13</sup> and the effects of a move from a hot to a cold climate should not be underestimated, since there is less incentive to go out in the sun in Britain.<sup>14</sup>

It is frequently stated that the Asian preference for a secluded life style and the female obligation to cover the skin adequately on leaving the house contributes to their low serum 25(OH)D concentrations, and there is some biochemical evidence to support this claim.<sup>15</sup> Our finding of lower 25(OH)D concentrations among indigenous Pakistani women compared with the men presumably reflects the widespread observance of purdah, but the intense source of solar ultraviolet light available in Pakistan nevertheless is enough to maintain normal 25(OH)D concentrations in most of the women. On migration to a country with a restricted availability of ultraviolet light Asians do not change their cultural practices in a way which compensates for this disadvantage, and the ambient 25(OH)D concentrations are consequently lower than in their home country. Osteomalacia and rickets do occur in India under certain environmental conditions,<sup>1</sup> but our results suggest that this does not indicate a suboptimal vitamin D state in the population as a whole.

It is debatable whether exhortations to the Asian community to increase their exposure to the sun will prove an effective prophylactic measure against vitamin D deficiency. Disappointing results of such a policy have been obtained in Rochdale,<sup>2</sup> and there are moral objections to a campaign which actively encourages changes in the cultural practices of migrants which are related to deeply held religious beliefs. Cultural change may hold the key to the long-term reduction of this environmental problem, but perhaps we should allow "natural adaptation" to take place without enticement. In our opinion, the only way to guarantee a rapid improvement in the vitamin D state of the Asian community is to provide extra vitamin D. The most efficient way is by supplementation.<sup>3,16</sup>

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## Epidemiology of cholera in travellers, and conclusions for vaccination recommendations

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### Abstract

All cases of cholera imported to Europe and North America between 1975 and 1981 were reviewed to assess the danger of cholera for visitors to endemic areas. Data were obtained from the health authorities of the respective countries.

From a total of 129 cases notified to the World Health Organisation detailed reports were obtained on 117 patients. Of these, 66 (56%) were immigrants, refugees, from endemic areas, or foreign workers returning from leave in their native countries. Only 51 (44%) were citizens of countries in Europe or North America. The incidence per journey for foreign travellers visiting Africa or Asia was about 1 in 500 000. Stay in hospital was always short, and fewer than 2% of patients died.

In view of the minimal risk and lack of reliability of cholera vaccination, such protection is not indicated for ordinary tourists visiting developing countries.

### Introduction

There are vast discrepancies about who should be immunised against cholera. For example, *Manson's Tropical Diseases* still claims that cholera vaccination "is necessary for travellers to West and East Africa, Egypt, the Sudan, the Near and Middle East, Pakistan, India, Burma and South East Asia."<sup>1</sup> In contrast,

the US Department of Health and Human Services recommends such immunisation only if an international certificate of vaccination against cholera is required as a condition for entry, or for "special high-risk groups that work and live in highly endemic areas under less than adequate sanitary conditions and those persons with compromised gastric defense mechanisms."<sup>2</sup> The World Health Organisation does not expressly state that any traveller should have this vaccination.<sup>3</sup> To clarify this disparity we have analysed all cases of cholera imported to Europe and North America (Canada and the United States) in the period 1975-81.

### Methods

The health authorities of all industrialised countries in Europe and North America who notified the WHO of imported cases of cholera were asked in each case to fill in a questionnaire covering both personal data (age, sex, nationality, country of residence, destination, purpose and duration of the journey, and previous vaccination) and specific information about the cholera (presumed place of infection, clinical course). Only those cases that were confirmed microbiologically and were imported after infection abroad are included here. Only the health authorities of Spain and Yugoslavia failed to reply.

### Results

Between 1975 and 1981, 129 cases imported to European countries or to North America were detected. Of the 117 patients on whom complete data were available 51 (44%) were citizens of industrial nations. Of these, 34 went to the endemic area for a holiday, six for a visit, and seven for professional reasons; in the remaining four the purpose of the journey was unknown. Thirty per cent of this partial population stayed in the endemic region for less than a week, and 88% for up to one month. Foreign workers living in industrial countries who returned after a home leave in their native countries accounted for 44 patients (38%), while 22 persons (19%) were immigrants, refugees, or tourists from endemic areas.

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