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Consensus Review

Bone Health




The unrecognised epidemic of vitamin D deficiency in Black, Asian and Minority Ethnic (BAME) groups: a consensus document

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Guidelines in practice

The unrecognised epidemic of vitamin D deficiency in Black, Asian and Minority Ethnic (BAME) groups: a consensus document

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Preface

Why BAME groups and why now?

In October 2020, a group of experts came together for a remote panel discussion to consider current knowledge on vitamin D and bone health within Black, Asian and Minority Ethnic (BAME) groups. Agreeing on the importance of vitamin D deficiency and insufficiency in these groups, our objectives were to provide an up-to-date synthesis of current evidence and knowledge. However, we wanted to go beyond defining the problem and provide a consensus on recommended actions to be taken to tackle low vitamin D status and related bone health consequences in those from BAME backgrounds.

We believe there has been a lack of urgency regarding the known health consequences of vitamin D deficiency and insufficiency in BAME populations. Although the high prevalence of both deficiency and its musculoskeletal consequences in these groups have been recognised for several years, it has taken the recent global pandemic and resulting restrictions on outdoor activity, as well as higher mortality due to COVID-19 in these groups, to bring the topic into focus. With COVID-19 drawing wider attention to the effects of lockdown and health inequalities based on ethnicity, alongside an expanding body of research on bone health and vitamin D, it seems like a propitious time to re-evaluate the evidence and move from discussion to action.

Disclaimer

This consensus document was produced from outputs by an expert panel formed under auspices of an unconditional educational grant from STADA incorporating Thornton & Ross. The expert panel have expressed their own opinions based on the state of the field, data and guidelines available at the time of the original remote panel meeting. There are currently no prescription vitamin D products indicated outside of prevention or treatment of vitamin D deficiency/insufficiency or as an adjunct to specific osteoporosis therapy in vitamin D deficient patients or those at risk of insufficiency. The value of vitamin D products in other settings is unproven at present. Use in other settings is off-label and at the discretion of the healthcare professional.

Background

Vitamin D is essential for musculoskeletal health and several significant health consequences are associated with a deficiency, including rickets in children and osteomalacia in adults.[1–4] Moreover, increasing evidence supports a possible role of vitamin D in various non-musculoskeletal outcomes, such as respiratory health, immune modulation, infectious diseases, cancer and cardiovascular health.[3,5]

Despite the known health consequences, vitamin D insufficiency and deficiency are common[1,5,6] and particularly prevalent in certain high risk groups, including BAME populations.[7–10] For this reason, some authors have referred to the high rates of vitamin D deficiency among the general population as a 'crisis', and among BAME groups as an 'unrecognised epidemic'.[8]

Prevalence of vitamin D insufficiency and deficiency among BAME groups

Vitamin D insufficiency and deficiency are common worldwide.[9,10] In the UK, low vitamin D status (<50 nmol/L) is estimated to affect 29% of adults aged 19 to 64 years and 27% of those over 65 during the winter months.[11] Among BAME groups in the UK, studies have reported even higher rates than among general population samples that comprise a majority Caucasian group. Rates of 55% with deficiency and 92% with insufficiency have been reported in South Asians,[8] 43–66% with deficiency in a mixed ethnic minority group,[12] and 47–64% with deficiency in pregnant women from BAME groups living in London.[13]

While prevalence estimates vary depending on study location and specific ethnicities sampled, most authors agree there are significantly high rates of vitamin D deficiency in BAME groups, and it appears these are higher than among Caucasians living in the same communities.[7] Moreover, deficiency and insufficiency of vitamin D may lack seasonality in these groups, with evidence supporting year-round deficiency in UK South Asians, irrespective of available dietary and UV sources of vitamin D.[14,15]

Vitamin D synthesis: all things are not made equal

People from BAME backgrounds are subject to increased risk of vitamin D insufficiency and deficiency for several reasons and may be affected by multiple overlapping risk factors.

Insufficient sun exposure

Vitamin D is synthesised in the skin when it is exposed to UVB-containing sunlight.[1] However, due to the high latitude of the UK, UVB sunlight is not available during the winter months (roughly October to April).[16,17] During these months, there is an increased risk of low vitamin D status for the whole population.

However, those from BAME groups may have lower production of vitamin D in the skin due to reduced skin exposure to UVB as a result of cultural dress and sun avoidance.[18,19] Indeed, comparisons of veiled and partly veiled women, within the same culture, have shown lower vitamin D levels in the former.[20,21] Moreover, due to absorption of UVB radiation by melanin, darker skin requires greater exposure than fair skin to synthesise the same amount of vitamin D.[1,11,13,15]

As such, individuals from BAME groups are unlikely to synthesise sufficient vitamin D from sun exposure in the UK and guidelines for safe sun exposure to ensure adequate production of vitamin D may not be appropriate for those with darker skin.

Need for sources other than diet

Evidence suggests that in some BAME groups, for example South Asians living in western countries, low intake of dietary sources of vitamin D play a role in their vulnerability to vitamin D deficiency and insufficiency.[8,22] Furthermore, vegan and vegetarian diets, particularly among Indian populations, may limit dietary sources of the vitamin.[23] Regardless of a person's ethnicity or culture, gaining adequate vitamin D from dietary sources is very difficult without the consumption of fortified foods.[22]

Nonetheless, evidence suggesting that dietary intake of vitamin D is even lower in some BAME groups, such as South Asians, compared with the UK national average, suggests the need for other sources of the vitamin.[22]

High rates of obesity

Rates of obesity are high among some BAME groups – an analysis of the UK Biobank cohort (n=6433) suggested rates of overweight and obesity (BMI>25) of 60–75% among South Asians.[6] Higher BMI increases the risk of lower plasma 25OHD levels (a proxy of vitamin D status), potentially due to sequestering in adipose tissue or higher fluid volumes in a larger body.[22]

Other at-risk groups and risk factors

Other risk factors such as age are important. Those over 65 are an at-risk group for vitamin D deficiency and within this age group, individuals with vitamin D deficiency are subsequently at risk of bone loss, muscle weakness, falls and fractures.[2,3,24] With increased age, skin thins and becomes less efficient at producing vitamin D through sun exposure than the skin of younger adults.[25,26]

Pregnant and breastfeeding women are also an at-risk group, with a number of possible negative consequences for both mother and baby.[13] These include infantile rickets, poor foetal growth, neonatal hypocalcaemia, gestational diabetes and preeclampsia.[13] In the UK, vitamin D deficiency during pregnancy is seen at much higher rates among BAME women (47–64%) compared with Caucasian women (13%).[27] The risk of vitamin D deficiency also increases in women with multiple pregnancies.

From this research, it is clear that BAME individuals may have overlapping risk groups and risk factors that further compound their already high risk of vitamin D deficiency or insufficiency.

Health inequalities: the consequences of vitamin D deficiency and insufficiency among BAME groups

The differences between ethnicities in vulnerability to and prevalence of vitamin D deficiency and insufficiency, and its consequences, are related to several health inequalities. Such inequalities have been brought into sharper relief during the COVID-19 pandemic.

With mounting evidence showing that individuals from ethnic minorities have been harder hit by the SARS-CoV-2 virus and

its associated disease COVID-19,[28–31] vitamin D status has been proposed as one possible cause of this vulnerability.[32–39] While recent rapid reviews by the National Institute for Clinical Excellence (NICE)[40] and the Scientific Advisory Committee on Nutrition (SACN)[41] reported insufficient evidence for a protective effect of vitamin D treatment in respiratory infections or COVID-19, research is ongoing.

Regardless of the final conclusions, the effects of lockdown on vitamin D status have brought the importance of lower vitamin D status in BAME populations to the forefront of minds in the medical community, as well as the wider general public. It is well documented that vitamin D plays a role in bone health and evidence suggests adverse health outcomes associated with vitamin D deficiency are more prevalent among BAME individuals.

Hypocalcaemic complications and rickets

Hypocalcaemia can result from vitamin D deficiency and can lead to a variety of complications in infants, including poor feeding, seizures, breathlessness due to heart failure and rarely, death.[42,43] Recent data suggest that nearly half of BAME new-borns are vitamin D deficient (regardless of the time of year they were born), placing them at risk of hypocalcaemic complications. Moreover, rates of hypocalcaemic complications appear to have increased, with the vast majority of cases in individuals from BAME backgrounds.[44,45]

There has also been a resurgence in nutritional rickets worldwide, with incidence rising globally, resulting from vitamin D deficiency and the related hypocalcaemia.[45–47] This has also been seen in the UK, where hospitalisation rates for rickets were higher in the 2010s than in previous recent decades.[48] Studies showing increasing rates of rickets in the UK indicate that BAME groups are most susceptible, making up the vast majority of cases.[46]

Osteoporosis and age-related fragility fracture

The incidence of osteoporosis and age-related fragility fracture also vary by ethnicity both between and within countries.[49] While osteoporosis has been considered a disorder mostly affecting postmenopausal white women, there are several factors that affect risk including bone mass density (BMD), body size, bone size etc.[50] While Black populations may be at lower risk of osteoporosis and age-related fragility than other ethnic groups, due to the protective effects of higher BMD, Asian populations may be at higher risk due to lower BMD.[51] These differences further support the need for targeted bone health relevant interventions based on ethnicity.

Other non-musculoskeletal outcomes

Vitamin D deficiency has been associated with a number of non-musculoskeletal outcomes, including type II diabetes, rates of which are high among some BAME groups.[52–54] However, these associations are yet to be fully elucidated.

As stated above, there have also been associations reported between vitamin D status and respiratory health outcomes, most recently COVID-19. These proposed associations are based on plausible biological mechanisms by which vitamin D could influence COVID-19.[55,56] Evidence for a protective role of vitamin D preparations[A] against acute respiratory illness more generally remains insufficient[40,41] but there is growing interest and ongoing randomised controlled trials that aim to produce more robust evidence.

While evidence continues to be sought, any possible beneficial effect of vitamin D on non-musculoskeletal health in BAME groups will be an added bonus in addition to protection of bone health in this high-risk group.[58]

The importance of vitamin D during the pandemic has been recognised by Public Health England (PHE) recommendations, which were updated to advise that the whole UK population take a vitamin D preparation (400 IU (10 µg) daily) throughout the year, and free supplies of the vitamin have been provided to the extremely vulnerable.[59,60] This was based primarily on the potential effect of isolation and limited movement, making it even less likely that people would get enough sun exposure to synthesise sufficient vitamin D.[61]

With the documented high prevalence of vitamin D deficiency and its consequences among BAME groups, compounded by the more recent effects of isolation and limited movement during the pandemic, it is likely the majority of BAME individuals have insufficient vitamin D levels. However, PHE guidelines did not highlight BAME groups as a particular high-risk group or provide any specific recommendations based on ethnicity. This is problematic for several reasons.

Failing to consider individuals in groups at risk of vitamin D deficiency (for example those from BAME groups), overlooks the fact that many such individuals already have vitamin D insufficiency or deficiency. Therefore, the recommended preventative dose of 400 IU (10 µg) a day will be insufficient to improve their vitamin D status and a prescribed vitamin D preparation at a licensed dose (800 IU [20 µg] or higher) would be more appropriate. Such doses have already been proposed elsewhere, as an approach to support immune and bone health.[62] Indeed, Griffin et al. suggest mandated prescriptions for individuals in care homes, prisons and other institutions as it is likely they spent much of the summer indoors.[62]

[A] NB: In this manuscript, we follow the terminology used by Wan et al.,[57] with the term 'preparation' used to refer to licensed vitamin D formulations that contain cholecalciferol. 'Supplement' is used where unlicensed products are mentioned, the contents of which are more variable and unregulated (see section *Sources of vitamin D* below).

Guidelines for vitamin D intake: one size does not fit all

In the UK, immigration of individuals from regions such as South Asia, Africa and the Middle East have likely played a role in the resurgence of bone health conditions related to vitamin D deficiency.[46] Of course, there are other contributory factors – the UK appears to have a higher rate of vitamin D deficiency compared with other high latitude countries even after accounting for ethnicity.[63] Factors such as a lack of mandatory food fortification and low adherence to infant vitamin D supplementation play a role.[45]

Nonetheless, in a broader sense, the predominance of musculoskeletal disease resulting from vitamin D deficiency among infants and adults from BAME groups highlights how the UK has failed to adapt public health policy to its increasing ethnic and cultural diversity.[46] This is resulting in disparate disease risk and health outcomes, with potentially devastating consequences for BAME individuals.

Failing to recognise specific groups

Current SACN guidelines[2] recommend a daily dose of 400 IU (10 µg) to all UK adults, without consideration of ethnicity or other risk factors. Given the specific needs of the BAME groups discussed above, this is likely to be inadequate, especially with current lockdowns further exacerbating low vitamin D levels in high risk groups. Moreover, skin pigmentation coupled with inadequate skin exposure to UVB-containing sunlight means BAME individuals are more dependent on dietary sources of vitamin D, whether as food or a vitamin D preparation.[64]

Similarly, while NICE provide guidelines for prevention in "specific population groups"[65] and highlight those most at risk, they do not specify guidelines for diagnosis, prevention or treatment of vitamin D deficiency in BAME groups specifically.[4] Instead, these groups are subsumed within all at-risk groups with a call for further evidence regarding the effectiveness and cost-effectiveness of interventions to increase vitamin D in at-risk groups. NICE is not alone in failing to provide ethnicity-specific guidelines (see Table 1).

PHE also fail to treat pregnant women as high risk even though evidence suggests a need for higher dose vitamin D in pregnancy regardless of ethnicity.[64] Currently, NICE, SACN and PHE do not distinguish between white and BAME pregnant women in their recommendations, but the Royal College of Obstetricians and Gynaecologists (RCOG) do. Therefore, recommendations for vitamin D requirements in pregnancy should be clarified and better reflect the evidence available.

There is also a lack of clarity regarding guidance for children under four years old. SACN does not specify a recommended intake for children under four, but only a safe intake (i.e., a recommended daily allowance) of 340–400 IU (8.5–10 µg) daily for infants under one year and 400 IU (10 µg) daily for those aged one to four years.[2] The lack of a robust, systematic and monitored programme of vitamin D preparations for infants and young children may further exacerbate current rates of vitamin D deficiencies, particularly among BAME infants, who are at particular risk of serious consequences such as hypocalcaemic complications.

A need for change

Current evidence indicates a need for vitamin D guidelines that are appropriate to the specific needs of BAME groups. There are differences in bone mass and calcium metabolism between different ethnicities.[49–51] Moreover, some factors described above (such as reduced sun exposure) mean that individuals from BAME groups have a greater dependence on dietary intake of vitamin D to maintain healthy levels. For these reasons, current guidelines for preventing vitamin D deficiency, which are based primarily on research in predominantly white samples, are unlikely to be appropriate for people of other ethnicities.

Moreover, considering the fact that a large proportion of those from BAME backgrounds are deficient in vitamin D all year round (regardless of supplementation and dietary intake), there is a strong argument for the use of licensed higher doses of prescribed vitamin D preparations in this population. Especially where other risk factors co-exist and/or the patient has comorbidities that increase risk (e.g., older age, malabsorption disease, etc.). BAME individuals should be encouraged to approach their GPs to have their vitamin D status tested.

Furthermore, prevention of vitamin D deficiency should be managed under medical supervision alike to its treatment whereby quality, efficacy and safety of the drug are regulated.[57] Currently, food supplements are used interchangeably with licensed preparations to fulfil vitamin D prescription, but supplements are not manufactured to the same stringent quality standards as licensed preparations. This means there is wide variation in actual vitamin D content and risk of under- or over-dosing. For this reason, regulation of vitamin D preparation as medicinal products has been proposed, to ensure that prescriptions are filled with licensed medicinal-grade preparations.[57,69] This would mean healthcare professionals can trust that patients are receiving the intended dose.

While research to determine appropriate 25OHD thresholds and doses required to meet these for optimal bone health in BAME groups is ongoing, our expert consensus is that there is sufficient evidence to support the need for higher doses in these populations. These doses would remain well within safe limits, while not exceeding those advised elsewhere worldwide (e.g., in the US).[62,70–72]

Widespread blood tests to identify deficiency and determine individual dosage are neither feasible nor cost-effective. Therefore, a standard dose range to prevent and treat vitamin D

Table 1: Daily vitamin D recommendations for the general population

Organisation (date)	Prevention guidance (daily intakes)	Treatment guidance
Scientific Advisory Committee on Nutrition (2016)[2]	**0–1 year** No recommendation [safe intake: 340–400 IU (8.5–10 µg)] **1–4 years** No recommendation [safe intake: 400 IU (10 µg)] **4+ years** 400 IU (10 µg)	N/A
NICE (2020)[4,66]	**0–1 year** 340–400 IU (8.5–10 µg) **1 year+** 400 IU (10 µg)	**Children** *1–5 months* 3000 IU (75 µg) daily for 8–12 weeks *6 months–11 years* 6000 IU (150 µg) daily for 8–12 weeks *12–18 years* 10,000 IU (250 µg) daily for 8–12 weeks **Adults** *Deficiency (25OHD <25 nmol/L)* Loading dose of up to 300,000 IU (7.5 mg) as weekly or daily split doses Lifelog maintenance dose of 800 IU (20 µg) daily (higher dose up to 2000–4000 IU (50–100 µg) for certain groups, e.g., those with malabsorption disorders) *Insufficiency (25OHD 25–50 nmol/L)* Maintenance doses started without the use of loading doses.
Royal Osteoporosis Society (2020)[1]	Maintain vitamin D through safe sun exposure and diet	**Children** *1–5 months* 3000 IU (75 µg) daily for 8–12 weeks *6 months–11 years* 6000 IU (150 µg) daily for 8–12 weeks *12–18 years* 10,000 IU (250 µg) daily for 8–12 weeks (single or divided dose totalling 300,000 IU if compliance is a concern) **Adults** *Rapid correction* Approximately 300,000 IU (7.5 mg) vitamin D3 (or D2) orally in divided doses over 6–10 weeks. Maintenance dose 4 weeks after loading of 800–2000 IU (20–50 µg) daily or intermittently at higher equivalent dose *Elective correction* Maintenance dose as above without a loading dose
Institute of Medicine, USA (2010)[67]	**1–50 years** 600 IU (15 µg) **Pregnancy** 600 IU (15 µg) **51–70 years** 600 IU (15 µg) **71 years+** 800 IU (20 µg)	**Adults** 50,000 IU (1,250 µg) weekly for 8 weeks or its daily equivalent followed by a maintenance dose of 1500–2000 IU (37.5–50 µg daily)
Royal College of Gynaecologists (2014)[27]	**Pregnancy** 400 IU (10 µg) **High-risk women*** 1000–3200 IU (25–80 µg) [upper limit of 4000 IU (100 µg)]	20,000 IU (500 µg) for 4–6 weeks followed by standard supplementation For women who require short-term repletion, 20,000 IU weekly is an effective and safe treatment, followed by a daily maintenance dose of 1000 IU (25 µg)
European Food Standards Agency (2016)[68]	**Infants 7–11 months** 400 IU (10 µg) **1 year+ (including pregnant/ lactating women)** 600 IU (15 µg)	N/A

*Defined as women with increased skin pigmentation, reduced exposure to sunlight, or those who are socially excluded or obese

deficiency in those from BAME groups is required such that recommendations consider the specific needs of this population.

A clinical consensus on vitamin D for bone health in BAME groups

The following consensus statements were agreed by the expert panel and inform our stance and recommendations going forward.

A need for updated guidance

National guidelines do not address the issue of the specific risk or needs of BAME groups; there is a need for them to do so. There is a need to update current recommendations for these populations because:

- Given the evidence for negative bone health consequences, all BAME groups should be considered at high risk of vitamin D insufficiency and deficiency, without further subdivision by ethnicity.
- To protect bone health in BAME populations, a life stage approach should be taken to determine the dosage of vitamin D preparations for children, adults and pregnant women.
- Current dose recommendations for vitamin D preparations that target plasma 25OHD levels do not consider the particular needs of BAME populations, and specific criteria should be created to ensure appropriate doses are advised and prescribed[B] to prevent/treat deficiency.

Sources of vitamin D

Vitamin D can be obtained from multiple sources, offering several potential approaches to increasing vitamin D levels in BAME groups. Our discussion centred on the most practical and reliable sources for these populations.

Dietary sources:

- While recommendation of fortified foods could support improved vitamin D status in BAME individuals, there is no mandatory fortification of common food items in the UK. Therefore, it is an unreliable way to achieve the required recommended dose of vitamin D, especially among those following special diets such as vegan, vegetarian, gluten-free etc.
- It is impractical for many individuals from BAME groups to get enough vitamin D from sunlight and very unlikely that they will have high enough intake from diet, therefore additional support from a vitamin D preparation is necessary for good bone health.

Vitamin D supplements and licensed preparations:

- Vitamin D supplements provided over the counter are treated legally as food, such that there is no oversight of manufacturing, contents or efficacy. Given the evidence for ±60% variability of contents from that stated on labels, food supplements represent an unreliable source of vitamin D that can lead to under- or over-dosing.[73,74] Therefore, a licensed vitamin D preparation should be prescribed to ensure the product contains the appropriate intended dose, and to ensure the patient is medically supervised to consider comorbidities and other medications whereby contraindications may be a concern.
- Consensus was reached regarding the need for updated guidance and the support of a vitamin D preparation in addition to dietary advice for BAME individuals. As such, the expert panel discussed and reached a consensus on dosage.
- BAME individuals require a daily vitamin D preparation at a higher dose than that currently recommended by PHE.

Recommendations

The consensus reached by the expert panel led to recommendations for action, as follows:

Prevention of low vitamin D

- All individuals from BAME backgrounds should take a year-round vitamin D preparation to address likely vitamin D deficiency/insufficiency due to the impracticality of achieving high enough levels for good bone health from other sources.
- BAME adults, particularly those aged 65 years or over and all pregnant women, should be encouraged to have their vitamin D status checked by their primary physician.
- Clinicians should consider individual factors (such as dietary choices or cultural factors, for example) that might make achieving adequate vitamin D levels impractical or impossible when advising individuals on how to improve vitamin D status and the value of taking licensed preparations.
- Organisations developing guidelines for vitamin D should address BAME groups as a specific risk category with particular needs.
- Change should be driven by co-creation and collaboration with the BAME communities and their community leaders.
- To support paediatric bone health, a monitored and mandated programme to deliver licensed vitamin D preparations should be created alongside existing immunisation programmes.

[B] While there may be some concerns regarding funding of prescriptions, Wan et al.[57] suggest that the extra costs of using only licensed preparations for vitamin D deficiency would be outweighed by the UK government's recent recommendation to limit vitamin D prescribing to therapeutic treatment of vitamin D deficiency only (saving £18.6 million in costs, based on 2018 figures for vitamin D tablet or capsule preparations containing ≤800 IU alone).

Our recommended daily dosages throughout the year for vitamin D preparations in BAME individuals are:

Adults and children above 11 years from BAME groups should be advised to take or be prescribed a daily vitamin D preparation of 800 IU (20 µg) to 1,000 IU (25 µg) to protect their bone health.

Pregnant women from BAME groups should be advised to take or be prescribed a daily vitamin D preparation of at least 800–3200 IU (20–80 µg) to protect their bone health, and to protect the developing foetus.[C]

BAME infants under 1 year (whether breast fed or formula fed) should be prescribed a daily vitamin D preparation of 400 IU (10 µg). Children aged 1–11 years should be prescribed a daily vitamin D preparation of 600 IU (15 µg) throughout the year to protect their bone health.

Raising awareness: new ways to reach stakeholders

The disparity in health between ethnicities where vitamin D is concerned has been observed in the scientific literature for some time, but little action has been taken. It is clear that previous approaches have not created change and therefore, new ways of raising awareness must be considered to ensure our recommendations are implemented and successful.

To raise awareness of the specific needs of BAME individuals in terms of vitamin D and bone health, we recommend:

- Communicating a long-term, lifelong narrative of vitamin D for life, with widespread education led by HCPs.
- Creating multilingual resources and messaging (in languages relevant to all BAME communities), with a grassroots approach involving local leaders (for example, faith leaders etc.).
- Using new ways to reach out to people to enable communication among all stakeholders, including the general public. Therefore, non-traditional messaging, such as posters, social media, TV and radio should be considered to deliver education and raise awareness.

Further research and policy recommendations

- A systematic review of research should be conducted to understand current knowledge and any gaps regarding appropriate target 25OHD levels for BAME groups. Furthermore, studies in BAME groups should be funded and conducted to address the current lack of evidence.
- A scientific committee should be convened to determine the extent of involvement of vitamin D outcomes beyond bone health.
- When conducting studies and surveys of vitamin D deficiency or interventions to improve vitamin D status, populations should be considered by ethnicity.
- We need to move away from sociological research into the problem and consider other factors, such as biological influences on vitamin D and health consequences in BAME individuals.
- Change should be implemented through cross-discipline and cross-organisation collaboration, including for example the Royal Pharmaceutical Society, Royal Society for Public Health, Royal Osteoporosis Society, SACN, British Medical Association, NICE and other relevant associations. In particular, healthcare professionals at the forefront of managing the consequences of vitamin D deficiency should be engaged and involved at an early stage.
- Research to study the beneficial effects of vitamin D in BAME groups for non-musculoskeletal conditions, in particular COVID-19 related illness, should be encouraged.

[C] Calcium intake should be determined by guidelines set out by the Royal College of Obstetricians and Gynaecologists (RCOG).[27]

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Guidelines in practice