

Use of Vitamins and Minerals in the Treatment of Hair Loss: A Cross-Sectional Survey among Dermatologists in Saudi Arabia

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Background: Several controversies exist regarding the use of vitamin and mineral supplements in treating hair loss.

Objectives: To explore practices, knowledge, and attitudes for using vitamins and minerals in treating hair loss among dermatologists in Saudi Arabia.

Methods: A self-administrated questionnaire containing 33 questions was distributed to 177 dermatologists attending a national dermatology conference in Riyadh, Saudi Arabia, in 2012.

Results: Of the 177 attending dermatologists, 144 responded to the questionnaire (81% response rate). Vitamins and minerals were recommended for treating at least one type of hair loss by 60%. Vitamins and minerals were most commonly used for acute telogen effluvium (62%). The majority (72%) reported a good knowledge of vitamins and minerals toxicity.

Conclusion: Although dermatologists in Saudi Arabia displayed positive beliefs in the usefulness of vitamins and minerals in treating hair loss, further research is needed to prove their role in the management of different hair loss disorders.

Contexte: L'emploi des suppléments vitaminiques ou minéraux dans le traitement de la chute des cheveux soulève plusieurs controverses.

Objectif: L'étude visait à analyser les pratiques des dermatologues en ce qui concerne l'emploi des vitamines et des minéraux dans le traitement de la chute des cheveux, leurs connaissances en la matière et leur attitude à l'égard de ce moyen thérapeutique, en Arabie saoudite.

Méthode: Un questionnaire à remplir soi-même et comptant 33 questions a été remis à 177 dermatologues assistant à un congrès national en dermatologie, à Riyad, en Arabie saoudite, en 2012.

Résultats: Sur 177 dermatologues présents, 144 ont répondu au questionnaire (taux de réponse: 81%). L'emploi des vitamines et des minéraux était recommandé, par 60% des répondants, dans le traitement d'au moins un type de chute de cheveux. Les vitamines et les minéraux étaient surtout employés dans le traitement de l'effluvium télogène (62%) aigu. La plupart (72%) des répondants ont indiqué avoir une bonne connaissance de la toxicité des vitamines et des minéraux.

Conclusions: Bien que les dermatologues en Arabie saoudite se soient montrés favorables à l'utilité des vitamines et des minéraux dans le traitement de la chute des cheveux, d'autres recherches s'imposent afin de confirmer leur rôle dans le traitement de différents types de chute de cheveux.

HAIR SHEDDING is a common presenting symptom in dermatology. About one-half of men and one-third of women experience hair shedding during their lifetime.^{1,2}

Hair loss (alopecia) can be scarring or nonscarring.³ Androgenetic alopecia (AGA), telogen effluvium (TE), and alopecia areata (AA) represent the most common causes of nonscarring alopecia.² AGA is by far the most common cause of hair loss in both sexes.^{3,4} In men, the frontal hairline and the crown are the usual sites of hair thinning. In women, hair thinning is usually confined to the crown, sparing the frontal hairline.¹ TE is a common condition that results from a sudden shift of a large number of anagen hairs to the telogen on the scalp.² The resulting scalp hair thinning is usually diffuse; however, predominant bitemporal involvement is common. TE lasting for more

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than 6 months is called chronic TE.⁴ AA is an autoimmune disease that presents with well-defined round patches of hair loss.⁵ Scalp hair is the most commonly affected site.

Many treatment options exist for different types of hair loss disorders. However, vitamins and mineral supplements remain an important treatment option.⁶ Several studies have examined the role of vitamins and minerals in treating different types of alopecia and reported conflicting results. Moreover, overuse of vitamin and mineral supplements can result in adverse life events.^{6,7}

The aim of this study was to evaluate the practices, knowledge, and attitudes of dermatologists in Saudi Arabia with regard to the therapeutic use of different vitamins and minerals in a group of the most common hair loss disorders. No previous study has been conducted to explore dermatologists' practices and opinions regarding this hair loss treatment option. The results of this study may stimulate others to conduct more controlled trials to examine the efficacy and safety of these supplements in different hair loss disorders.

Methods

A written survey containing 33 questions concerning the use of vitamins and minerals for the treatment of the most common hair loss disorders was distributed to all 177 dermatologists attending a national dermatology conference in Riyadh, Saudi Arabia, in June 2012. Information regarding the dermatologist's practice and estimated number of patients with hair loss seen weekly during the last year and relevant personal information such as gender, age, and job titles were collected. The dermatologists completed the questionnaires on site at the conference.

The questionnaire addressed dermatologists' attitudes and practices regarding the use of four different vitamins and minerals, iron, zinc, biotin, and vitamin D, as well as supplements containing multivitamins and minerals, in the treatment of AA, AGA, and acute and chronic TE.

The dermatologists were also asked whether they routinely measure the serum level of any vitamin and mineral they use pre- and posttreatment. In addition, they were asked to provide information on the doses they routinely use as being equal to, less than, or more than the Recommended Dietary Allowance (RDA) of different vitamins and minerals. The duration of treatment was also addressed.

Their knowledge concerning vitamin and mineral safety, toxicity, and the RDA was also evaluated. The source of their knowledge and attitudes, whether they were

based on evidence-based medicine or on their personal experience, was also asked about.

The dermatologists' attitudes on whether to use vitamins and minerals in the treatment of hair loss disorders as a solo treatment or in combination with other therapies were also addressed. Finally, their views on the efficacy of vitamins and minerals in the treatment of hair loss disorders were also probed.

This study was approved by the Research Ethics Committee at Al-Imam Muhammad Ibn Saud Islamic University.

The survey data were analyzed using SPSS version 19 software (IBM Corporation, Armonk, NY). We used chi-square and Fisher exact tests for our comparison of nominal variables; p values ≤ 0.05 were considered statistically significant.

Results

Of 177 dermatologists attending the conference, 144 returned the questionnaires, for a response rate of 81%. Forty-four questionnaires were excluded (9 incomplete questionnaires and 35 filled by residents in a dermatology training program). One hundred practicing and certified dermatologists were included in the survey.

Thirty-two percent (32 of 100) reported seeing 5 to 10 patients with hair loss per week, and 12% (12 of 100) saw more than 10 patients per week. Seventy-two percent (72 of 100) of the respondents were male, and 41% (41 of 100) were younger than 40 years old. Specialists, that is, dermatologists who completed 2 years of specialized training and passed a qualifying examination, comprised 70% (70 of 100). The rest of the respondents were consultants, dermatologists who had completed a 4-year training program and passed a qualifying board examination.

Iron

Iron was used by 54% and 56% of the respondents to treat acute and chronic TE, respectively. On the other hand, only one-fifth of the respondents reported using iron to treat AA (21%) and AGA (17%). The frequency of using iron to treat any hair loss disorder by either specialists or consultants was not significantly different.

Zinc

Sixty-two percent of the respondents reported using zinc for treating acute TE, 46% for chronic TE, and only 22%



and 15% for AA and AGA, respectively. No significant association was appreciated between using zinc for any hair loss disorder and the respondent's job title.

Vitamin D

Vitamin D was used by 36% of the respondents for acute TE, 19% for chronic TE, and 16% for AGA. AA was the least common condition for which vitamin D was used (14% of respondents). Overall, vitamin D was the least commonly used vitamin for treating any hair loss disorder. No significant association was detected between different indications of vitamin D use and the respondent's job title.

Biotin

Acute and chronic TE were the most common diagnosis for which biotin was used (39% for each). Twenty-four percent used biotin for AA and 22% for AGA. The frequency of using biotin to treat any hair loss disorder by either specialists or consultants was not significantly different.

Multivitamin and Mineral Supplements

More than half of the respondents reported using multivitamin and mineral supplements for treating both acute and chronic TE (59% and 52%, respectively). Specialists

prescribed multivitamins for treating the latter two conditions significantly more frequently compared to consultants (p value $< .05$). Use of these supplements was less common for both AA (31%) and AGA (27%).

Dosage of Vitamins and Minerals and Duration of Treatment

One-third (34 of 100; 34%) of the respondents indicated using a dosage equivalent to the RDA. Twenty-eight percent (28 of 100) were not sure. Almost one-quarter of the respondents reported that they routinely measure the serum level of the given vitamins and minerals pretreatment (27%; 27/100) and posttreatment (25%; 25/100). In the latter, consultants were not significantly different from specialists (p value $> .05$). Only 2% (2 of 100) of the respondents reported using vitamins and minerals for less than 1 month. However, the majority (58%; 58/100) preferred a treatment course lasting for 1 to 3 months, and 40% (40 of 100) indicated a treatment course lasting for more than 3 months (Figure 1).

Dermatologists' Knowledge

Thirty-three percent (33 of 100) of the respondents indicated evidence-based medicine as the source of their knowledge about using vitamins and minerals for treating hair loss. Although not statistically significant, implementing evidence-based medicine was higher among specialists

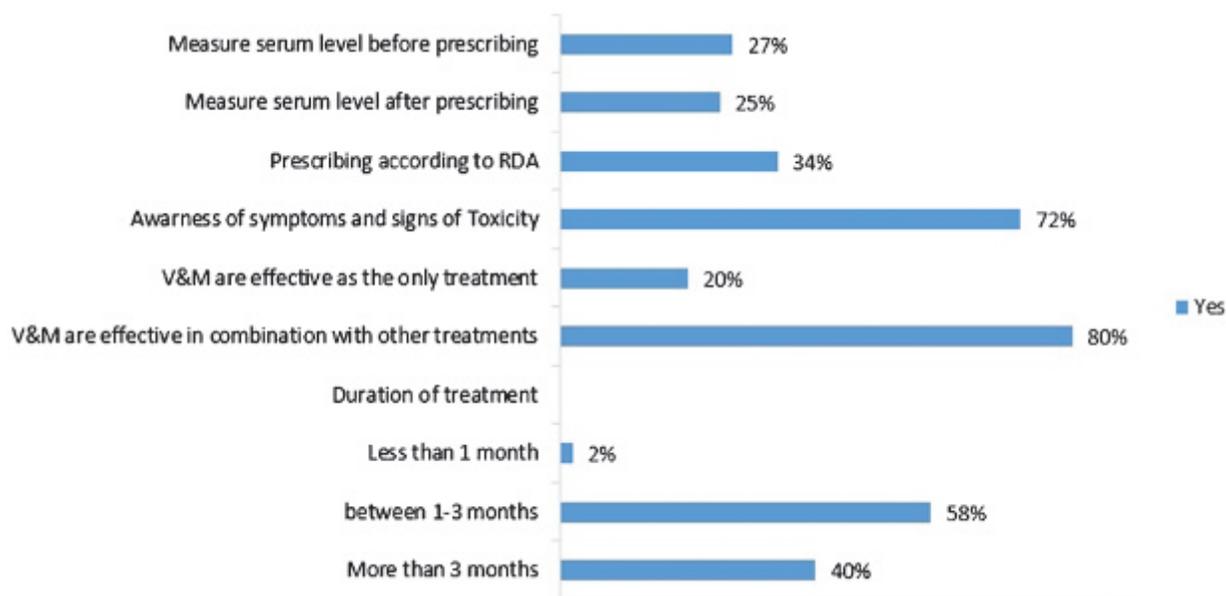


Figure 1. Dermatologists' practices and attitudes toward using vitamins and minerals (V&M) for treating hair loss disorders. RDA = Recommended Dietary Allowance.



(39%; 27 of 70) when compared to consultants (20%; 6 of 30). On the other hand, 58% (58 of 100) relied on their personal experience. Fifty-two percent (52 of 100) of the respondents reported being frequently asked by patients to prescribe vitamins and minerals to treat hair loss. Forty-four percent (44 of 100) believed that vitamins and minerals are more beneficial than harmful. The latter was not significantly different among specialists and consultants. Seventy-two percent (72 of 100) of the respondents indicated that they are aware of symptoms of vitamin and mineral toxicity (Table 1).

Dermatologists' Attitude

Fifty-nine percent (59 of 100) of the respondents believed that vitamins and minerals are generally effective in treating at least some types of hair loss disorders. Consultants (60%; 18 of 30) and specialists (58%; 41 of 70) were not significantly different (*p* value > .05). Most of the respondents (80%; 80 of 100) used vitamins and minerals in combination with other drugs. On the other hand, only 20% (20 of 100) indicated their use as a solo treatment (Table 2).

Discussion

To our knowledge, this is the first study to assess the practices, knowledge, and attitudes of dermatologists with regard to the use of vitamins and minerals in the treatment of hair loss. All respondents in this study are qualified certified dermatologists, and 44% of them reported seeing more than five patients with different types of hair loss per week, which makes the results of this study of great importance to this field, at least in Saudi Arabia.

The results of this survey reflect the uncertainty about the role of vitamins and minerals in treating different hair loss disorders. This was clearly confirmed by the variations

Table 1. Source of Dermatologists' Knowledge Regarding Using Vitamins and Minerals for Treating Hair Loss

	Yes, n/100 (%)	No, n/100 (%)
Based on evidence-based medicine	33 (33)	67 (67)
Personal experience	58 (58)	42 (42)
Not sure/vitamins and minerals are more beneficial than harmful	44 (44)	56 (56)

Table 2. Use of Vitamins and Minerals in Treating Different Hair Loss Disorders among Dermatologists

	AA, n (%)			AGA, n (%)			Acute TE, n (%)			Chronic TE, n (%)		
	S	C	O	S	C	O	S	C	O	S	C	O
Iron	23 (16/70)	17 (5/30)	21 (21/100)	13 (9/70)	27 (8/30)	17 (17/100)	53 (37/70)	57 (17/30)	54 (54/100)	61 (43/70)	43 (13/30)	56 (56/100)
Zinc	32 (16/70)	20 (6/30)	22 (22/100)	14 (10/70)	17 (5/30)	15 (15/100)	64 (45/70)	57 (17/30)	62 (62/100)	50 (35/70)	37 (11/30)	46 (46/100)
Vitamin D	14 (10/70)	13 (4/30)	14 (14/100)	16 (11/70)	17 (5/30)	16 (16/100)	37 (26/70)	33 (10/30)	36 (36/100)	23 (10/70)	30 (9/30)	19 (19/100)
Biotin	23 (16/70)	27 (8/30)	24 (24/100)	19 (13/70)	30 (9/30)	22 (22/100)	39 (27/70)	40 (12/30)	39 (39/100)	41 (29/70)	33 (10/30)	39 (39/100)
Multivitamins	31 (22/70)	30 (9/30)	31 (31/100)	26 (18/35)	30 (9/30)	27 (27/100)	66 (46/70)	43 (13/30)	59 (59/100)	60 (42/70)	33 (10/30)	52 (52/100)

AA = alopecia areata; AGA = androgenetic alopecia; C = consultants; O = overall (consultants and specialists); S = specialists; TE = telogen effluvium.

in the dermatologists' practices and opinions, which were generally not significantly different between the different levels of respondents, specialists and consultants.

Use of vitamins and minerals to treat hair loss seems to be a common practice among dermatologists in Saudi Arabia as 60% of the respondents reported their use for treating at least one type of alopecia. The latter might have been affected by the increased demand for their use by patients as 52% of the dermatologists indicated being regularly asked by patients to prescribe vitamin and mineral supplements for their hair loss disease. Similarly, in a recent cross-sectional survey involving 388 pharmacists, hair and nail loss was the most common indication for which pharmacists recommended vitamin and mineral supplements to patients.⁷

There is generally a lack of consensus about the role of vitamins and minerals, with the exception of iron, in the treatment of different types of alopecia. A thorough literature review failed to find strong evidence to support using most vitamins and minerals, except for iron and zinc, in treating different hair loss disorders.^{8–11} This was clearly encountered in our survey as most of our respondents relied on their personal experience rather than on evidence-based medicine. We briefly review the currently available literature regarding using iron, vitamin D, zinc, and biotin in different types of alopecia.

Iron

In rapidly dividing hair follicle matrix cells, iron has a very crucial role. It is required as a cofactor for ribonucleotide reductase, the rate-limiting enzyme for DNA synthesis.¹² It is also required for proper functioning of other hair follicle enzymes, such as stearyl-CoA desaturase, which might theoretically contribute to hair shedding.¹³ Iron deficiency may result from chronic bleeding, reduced oral intake, or malabsorption syndromes. Many studies have investigated the role of iron in the pathogenesis of different hair loss disorders. A recent animal study demonstrated the role of hepcidin, a key regulator protein for intestinal iron absorption, in controlling iron uptake in a hepcidin knockout mouse.¹⁴ The homozygotes given a normal mouse diet become iron deficient, anemic, and infertile (females) and have almost complete body hair shedding. However, when the diet was supplemented with iron, all symptoms resolved. Hepcidin hair follicle regulation might explain why only some iron-deficient individuals experience hair shedding. Hard was the first to postulate the role of nonanemic iron deficiency in induction of diffuse hair shedding in humans.¹⁵ Since then, many studies have

demonstrated a significant association between low iron stores, as measured by serum ferritin level, and common hair loss disorders such as AA, AGA and TE.^{8,11,16} The role of iron supplementation even without the presence of iron deficiency has been investigated. In a prospective cohort, 72 mg of iron and 1.5 g of L-lysine were given daily to 22 female subjects with chronic TE for 6 months. The mean percentage of the telogen hair significantly decreased from 19.5% to 11.3%, with a parallel increase in the serum ferritin.¹¹ Similarly, Rushton conducted a double-blind, placebo-controlled study in 12 female subjects with chronic TE (7 subjects received 72 mg of iron and 1.5 g of L-lysine daily for 6 months and 5 subjects received placebo). Hair shedding was reduced by 31% in the treatment group compared to a 9% increase in the control group.¹⁷

The level of serum ferritin necessary to correct iron-induced chronic TE has yet to be established, but unpublished data indicate that it is between 30 and 70 µg/L for the majority of those affected.^{18,19} Recently, a prospective cohort investigated 5,100 nonmenopausal women between 35 and 60 years of age and found that 59% of subjects who had excessive hair shedding had low iron stores (ferritin < 40 µg/L) compared to 48% of the remaining subjects. The authors concluded that a low iron store is a risk factor for excessive hair shedding.²⁰ Similarly, a case-control study investigated 108 female subjects with different types of alopecia and found that the mean ferritin level was significantly lower in subjects with AGA and AA compared to women without hair loss.⁸ However, the role of iron in the induction of AGA or AA has yet to be proven with well-controlled studies, keeping in mind that both TE and AGA can coexist, especially in women. In our study, iron was commonly used to treat different types of alopecia as more than half of the respondents indicated prescribing iron for TE, both acute and chronic types, and about one-fifth used it in cases of AA and AGA.

Zinc

Zinc is highly related to hair biology and growth. It is an important cofactor for more than 300 protein synthesis- and cell division-related metalloenzymes.²¹ In addition, it exerts a catagen inhibitory effect in the hair cycle via inhibiting several apoptosis-related endonucleases.^{21,22} The latter may allow highly proliferating hair follicles to maintain a healthy growth phase for a longer period of time.⁹ A potent immunomodulatory effect of zinc on the hair follicle has also been recognized.^{22,23} The latter may



have implications in the treatment of AA. Zinc deficiency may be acquired or congenital. Inadequate food intake and use of certain drugs, such as valproic acid and carbamazepine, are among the possible causes of acquired zinc deficiency.²³ Although TE is the usual type of hair loss that accompanies zinc deficiency, a low zinc level has also been reported in patients with AA.^{24,25} In one case-control study (50 subjects with AA and 50 matching controls), serum zinc level was found to be significantly low in subjects with severe, extensive, and treatment-resistant AA compared to controls.²⁵ On the contrary, other noncontrolled studies reported no clear association between AA or TE and low serum zinc level.²⁶ Zinc supplements have been used to treat a variety of hair loss disorders even in the absence of documented zinc deficiency.^{25,27} Correcting a low serum zinc level has been found to cure TE in one case series.²⁴ On the other hand, use of zinc in treating AA has revealed contradictory results.²⁸ Whereas a double-blind trial revealed a lack of therapeutic efficacy, a recent double-blind crossover study involving 100 subjects with AA showed complete hair regrowth in 59% of subjects who received oral zinc sulfate for 3 months compared to similar results in only 10% of those in the placebo group. Sixty-seven percent of the subjects in the latter group were able to achieve full hair regrowth after being shifted to the treatment group for 3 months.^{9,26}

In our study, zinc was the single most commonly used mineral to treat both acute and chronic TE. AA (22%) and AGA (15%) were the least frequent indications for using zinc. The latter results probably reflect the ongoing controversy in the literature, especially in cases of AA. More controlled studies are needed to examine the therapeutic efficacy of zinc supplementation on hair loss disorders and on AA in particular.

Vitamin D

Vitamin D is a key hormone that is involved in immunoregulation, cell growth, and differentiation.^{29,30} 1,25-Dihydroxyvitamin D₃, the active form of vitamin D, mediates its action by binding to nuclear vitamin D receptors (VDRs).³¹ VDRs are highly expressed in human and animal hair follicle key structures, the epidermal keratinocytes, and the mesenchymal dermal papilla cells.³⁰ VDRs can regulate nuclear gene transcription in both 1,25-dihydroxyvitamin D-dependent and -independent fashions.³² Furthermore, VDRs are essential for anagen initiation.³³ The occurrence of alopecia totalis in humans with hereditary 1,25-dihydroxyvitamin D₃-resistant rickets type II and VDR knockout mice further confirms the latter

association.^{30,34} On the contrary, no significant association was found between humans with acute and chronic TE who have normal VDRs and low serum 1,25-dihydroxyvitamin D₃.¹¹ Similarly, 296 healthy men were evaluated for a possible association between AGA and low serum 25-hydroxyvitamin D level, and no significant association was found.³⁴ Therefore, normally functioning VDRs may exert a more important role in maintaining normal hair cycle through signaling specific nuclear transcription factors rather than being affected by the serum level of vitamin D.

Considering the available literature, there are probably not enough data to support using vitamin D in the treatment of any hair loss disorder. In our study, vitamin D was the least commonly prescribed supplement for any type of hair loss.

Biotin

Biotin is an essential water-soluble vitamin. It acts as a coenzyme for 5-carboxylase enzymes, which are essentially involved in the metabolism of amino acids, fatty acids, and glucose.³⁵ Biotin deficiency results in a reduction in carboxylase activity. Consequently, major disturbances of the human body's metabolic functions may follow. Moreover, biotin plays a role in genome stability through binding to DNA-binding proteins, the histones.^{36,37} Considering the widely available nutritional sources of biotin, its deficiency is rarely encountered.^{37,38} Acquired biotinidase enzyme deficiency, an enzyme required for intestinal cleavage of biotin from food and transport of biotin in the plasma, may result from using certain drugs, such as anticonvulsants.^{35,37} Although complete biotin deficiency can be lethal, a partial deficiency may present with a phenotype that includes alopecia, fine, brittle hair, eczematous dermatitis, and behavioral changes.^{36,37} Biotin therapy has been reported to reverse the neurologic and cutaneous manifestations of biotinidase deficiency.^{35,36} Despite the above, more controlled studies are probably needed before recommending the use of biotin supplements in treating different hair loss disorders.³⁹ In our study, prescribing biotin was common among the dermatologists. One-quarter of the respondents reported using it for at least one type of alopecia. However, it was most commonly used for acute and chronic TE.

The average daily dietary intake level sufficient to meet the nutrient requirements of nearly 97 to 98% of healthy individuals in a particular age and gender group is called the RDA. A wide range of doses of vitamins and minerals formulated in over-the-counter single-nutrient or multi-vitamin supplements exist. Some may contain nutrients of



100% to more than 600% of the RDAs for adults.^{40,41} Moreover, prolonged consumption of high doses of certain vitamins and minerals has been proven to shorten the human life span.^{6,42} Dermatologists in our survey reported using a variety of different dosages of vitamins and minerals for treating hair loss disorders. Whereas one-third indicated using doses that are equivalent to the RDA, the majority were either not sure or used doses higher than the RDA. Surprisingly, although almost two-thirds of the respondents felt that they had good knowledge about vitamin and mineral toxicity, the majority (70%) did not perform biochemical investigations to check for the given vitamin's and mineral's serum level both pre- and postuse, which can increase the risk of toxicity in a subset of patients. Therefore, dermatologists probably need to implement a more conservative approach for using vitamin and mineral supplements or single-nutrient vitamins and minerals in treating different types of hair loss.

Overall, dermatologists in this study preferred relatively long treatment courses. The majority (58%) implemented a treatment course lasting for 1 to 3 months, and 40% indicated using a longer treatment course, lasting for more than 3 months. Restoring a normal hair cycle is generally a slow process. Moreover, the average growth rate of a normal hair fiber is 0.35 mm per day.^{1,4} Hence, relatively long treatment courses are generally needed for most hair loss disorders.

Both acute and chronic TE were the most common indications for using vitamins and minerals. Iron, zinc, and multivitamin supplements were the most commonly used supplements for the latter indications. AGA was the least common indication for which any vitamin or mineral was used.

The use of a convenience sample is a limitation of this study as dermatologists attending a scientific conference might not be very representative of all dermatologists in the country. However, due to the lack of postal addresses or a database for the dermatologists in this country, the distribution of questionnaires at a national conference was probably the best option available.

The strength of this study lies in its good sample size of 177 of all 520 practicing dermatologists in Saudi Arabia. Furthermore, to the best of our knowledge, there is no previous report on the dermatologist's or physician's attitudes and practices with regard to the use of vitamins and minerals in the treatment of hair loss in Saudi Arabia or the whole Middle East.

Although dermatologists in Saudi Arabia displayed positive beliefs in the usefulness of vitamins and minerals in treating hair loss, further research is needed to prove their role in the management of different hair loss disorders.

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