Clinical and Experimental Health Sciences

A Scale Development Study: The Vitamin D Health Belief Scale According to The Health Belief Model

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ABSTRACT

Objective: This study was conducted to develop Vitamin D Health Belief Scale based on the health belief model in adult women and determine its validity and reliability.

Methods: The sample of the study consisted of 404 women who were aged between 18 and 65, volunteered to participate in the study, and met study criteria. The theoretical framework of the scale was based on the health belief model. During the scale development stage, exploratory factor analysis and index values were evaluated by using confirmatory factor analysis, item-total correlation, and mean scores.

Results: The content validity index of the scale was found as 91.52%. As a result of the factor analysis, the variables were gathered under 6 factors with a total explained variance of 58.22%. Cronbach's alpha value of the scale was determined as.884.

Conclusion: As a result of all analyses, a 5-point Likert-type scale that consisted of 31 items was developed. Six factors were obtained from the scale: perceived sensitivity, caring, health motivation, perceived benefits, perceived barriers, and self-efficacy. The total score of the scale gives the Vitamin D Health Belief score. The lowest and highest scores on the scale which consists of 31items are 31 and 155 respectively. It is recommended to use this scale to determine vitamin D health beliefs in adult women.

Keywords: VitaminD, health belief scale, women, reliability, validity.

1. INTRODUCTION

Vitamin D, which is a fat-soluble vitamin, functions like a hormone in the body. It takes part in calcium absorption, bone development, and bone remodeling. (1) The Food and Drug Administration (FDA) has reported that vitamin D is an important factor in the control of serum calcium levels and bone homeostasis (Title 21: Food and Drugs Part 101 Food) (2). The functions of vitamin D include keeping serum calcium and phosphorus levels within a certain range, stimulating intestinal calcium absorption, and stimulating the activity of osteoclasts in the bone (3,4). It has been reported that one million people in the world suffer from vitamin D deficiency, and babies, girls, and women with pregnancy in almost all age groups are affected more than others (5,6). However, recent studies have shown that vitamin D deficiency may play a role in many chronic diseases, including cardiovascular diseases, diabetes, hypertension, depression, and autoimmune diseases, especially cancers(7-10). In fact, it has been reported that the coronavirus disease has been seen more frequently, it has progressed more severely, and mortality has increased significantly in individuals with vitamin D deficiency during the COVID-19 pandemic. It has been stated that the probability of catching the disease and the severity and mortality of the disease decrease in people with adequate vitamin D levels or who are given vitamin D (11). There is very little information about individuals' knowledge and beliefs about and attitudes towards vitamin D (10,12).

Some studies conducted on vitamin D knowledge and behavior have shown that women do not know how to benefit from vitamin D and cannot state vitamin D sources correctly (10,13). Also, 63.2% of the women in a study conducted in China and 53% of the women in a study conducted in Vietnam stated that they did not like to be exposed to sunlight (14,15). In another study conducted in Saudi Arabia, only 31% of the participants stated that vitamin D had an effect on bones and 77% had not heard anything about vitamin D (16). Similarly, in a study conducted with university students in China, 68% of the students stated that they did not have accurate knowledge about vitamin D and that vegetables and fruits were important sources of vitamin D (14). Many theories and conceptual models help nurses to prevent diseases and improve health (15,17). One of these models is the "Health Belief Model." It is the most commonly used model to explain health behaviors. The model explains determining factors related to the implementation of preventive health behaviors (18). When the health belief model is considered within the scope of health behaviors, it is the first model that has been adapted to reduce the probability of catching a disease and the severity of the disease and to prevent the disease as a result of health behaviors to be taken. This model guides us to learn about individuals' beliefs and perceptions about a disease (19).

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The Health Belief Model also motivates individuals to acquire positive health behaviors and avoid negative health behaviors. (18, 20). As a result, a vitamin D health belief scale is needed to find out women's level of attitudes, knowledge, and beliefs about vitamin D, which is an important problem, especially for them. No scale has been developed on this subject in Turkey. The aim of this study is to develop a Vitamin D Health Belief Scale, which is appropriate for Turkish society, for adult female individuals, and to determine its psychometric properties.

2. METHODS

2.1. Type of the Study

This study was conducted in a methodological descriptive research design to develop a vitamin D health belief scale for adult women and to determine its psychometric properties.

2.2. Study Setting

The study was conducted in a family health center in Istanbul province. The center provides primary health care, adult health screenings, and treatment services.

2.3. Population and Sample of the Study

The sample of the study consisted of female individuals who were literate, were aged between 18 and 65 presented to the family health center between June 2018 and September 2018, and agreed to participate in the study (Count of Items): (Count of observations/persons) ratio, which is a sample size calculation method suggested for scale development studies was used for calculating the study sample. According to this calculation method, a ratio of 5-30 observations per item is recommended. (21) The study was completed with 404 female individuals (n=404). In the literature, there are criteria regarding the determination of the sample group in relation to the number of items applied. However, it is stated in the literature that the sample size is very good with 500 people and excellent with 1000 people. From this point of view, the number of samples was kept high (22).

2.4. Data Collection

Data were collected based on self-reports under the guidance of the researcher. Before the draft form of the scale was applied to the study group, it was piloted to a small group (not included in the study, n=40) meeting the inclusion criteria of the study to test the intelligibility of the items. Afterward, the questionnaire was applied to 404 people. The purpose of the study and data collection methods were explained to the FHC administrators. After necessary permissions were obtained from the managers of the institution, the data collection tools were applied to the participants by the researcher. The data collection tools consisted of an information form, a demographic questionnaire with items about age, gender, educational status, and individual characteristics, and the final form of the scale. The scale development process took place in three stages.

Stage 1: Content Analysis and Item Production

Items should be defined in an observable and measurable way based on the theoretical definition of the feature to be measured. In the literature, it is stated that an item pool can be created by examining the scales developed related to the subject during the production of the items (23). However, no scale on health beliefs about vitamin D was found in the literature. During the production of the scale items, the following types of studies were utilized:(a) studies on vitamin D deficiency in women; (b) studies on the factors affecting women's knowledge, attitudes, and behaviors about vitamin D; (c) scale development studies in which health belief model was utilized as a framework. One of the most frequently used models in nursing in explaining individuals' health behaviors is the Health Belief Model (HBM). The model explains the determining factors for implementing preventive health behaviors. The theoretical framework of the scale developed in this study was created in line with the Health Belief Model (HBM). This allowed all levels of compliance to be measurable with a single measurement tool. An item pool that covered the six domains of HBM (perceived sensitivity, caring, health motivation, perceived benefits, perceived barriers, and self-efficacy) was created. The 39-item draft version of the scale was prepared by using the items selected from the item pool. The questions on the Osteoporosis Health Belief Scale developed by Kim Horan were used to create the item pool (24). Special care was taken to ensure that the items on the draft version were clear and intelligible. The evaluation style of the scale items was determined so that the items could be scored. It was decided to use a five-point Likert-type scale to evaluate each item that determined the feature to be measured. The options for scoring each item were as follows: "strongly disagree," 1 point; "disagree," 2 points; "undecided," 3 points; "agree," 4 points; "strongly agree," 5 points (25).

Stage 2: Content Validity Index

The draft scale was submitted to 10 academic nurses to determine its content validity. A space was left under each item to allow expert academicians to make explanations, and the experts were told that they could make corrections on the items if necessary. Experts were asked to evaluate each item on a four-point scale with the following options: very appropriate/very relevant (4 points); appropriate/relevant (3 points); somewhat appropriate/somewhat relevant (2 points); inappropriate/unrelated (1 point). Both item level (I-CVI) and scale level (S-CVI) content validity were calculated. (26). The I-CVI was obtained by dividing the count of experts who gave 3 or 4 points to an item by the total count of experts. The S-CVI was calculated by the ratio of the count of items that each expert gave 3 or 4 points to (28). After the forms were collected from the experts, all the evaluations were

combined into a single form. The item level CVI values varied between 80 and 100, with the mean value being 91.53. The scale level CVI values varied between 64.10 and 100, with the mean value being 91.52. The values obtained as a result of the content validity evaluation of the scale were higher than the recommended value of 90 (27), and it was decided that the scale had good content validity.

Phase 3: Pilot Study

The pilot study of the draft form of the scale was conducted on 40 female individuals to test the readability and intelligibility of the items. No changes were made to the scale items as a result of this study.

2.5. Statistical Analysis of Data

The data obtained in the study were analyzed on the SPSS (Statistical Package for Social Sciences) for Windows 22.0 and AMOS software packages. The kurtosis and skewness values of the normal distribution of the scale items were examined. In the relevant literature, it is accepted as a normal distribution that the results of the kurtosis skewness values of the variables are between +2.0 and – 2.0 The kurtosis and skewness values of the scale items were found between +2.0 and – 2.0. (27) Correlation coefficients were calculated to examine the distribution of each item. Construct validity of the scale was examined by using exploratory factor analysis. The varimax rotation method was used to maximize the variance explained in the exploratory factor analysis performed to examine the factor structure of the scale. Principal component analysis of exploratory factor analysis was used. The count of the factors of the scale was determined by evaluating the eigenvalue of each factor. The Barlett test was used to determine the factor loads of the Vitamin B Health Belief Scale, the regression coefficients of the items, and the relationship between the variables included in the factor analysis. Data collected from the field related to the scale were analyzed by using descriptive statistics, such as counts, percentages, means, and standard deviation values.

2.6. Ethical Aspects of the Study:

Before the research was initiated, the approval of the Ethics Committee of a university was obtained (date: June 4, 2018, protocol no: 150). During the data collection phase, participants were informed about the purpose of the study, and their verbal consent was obtained.

3.RESULTS

3.1. Characteristics of Participants

Of the participants, 32.2% were aged between 21 and 30, and 54% were single. It was determined that 59.2% of the participants were university graduates, 46.8% had been diagnosed with vitamin D deficiency before, and that 58.7% had received information about vitamin D before.

3.2. Content Validity

The CVR values of the scale items ranged from 0.8 to 1, and the CVI value was found as.915.

3.3. Exploratory Factor Analysis

Cronbach's alpha, which is the internal consistency coefficient, was calculated to determine the reliability of 31 items on the Vitamin D Health Belief Scale. The general reliability of the scale was found to be very high with an alpha value of 0.884. The explanatory factor analysis method was applied to reveal the construct validity of the scale. As a result of the Barlett test (p=.000<.05) it was determined that there was a relationship between the variables included in the factor analysis**.** As a result of the test (KMO=.896>.60), it was determined that the sample size was adequate for factor analysis. The correlation value of the scale's split-half method was found to be.899 The factor structure determined by using explanatory factor analysis was tested with confirmatory factor analysis in the factor analysis, the varimax method was chosen to ensure that the structure of the relationship between the factors remained the same. As a result of factor analysis, the variables were gathered under 6 factors with a total explained variance of 58.22%. The factor structure of the scale is shown below (Table 1)

3.4. Confirmatory Factor Analysis and Construct Validity

The criteria for the goodness of fit obtained as a result of confirmatory factor analysis are given below (Table 2). The findings obtained in the research were evaluated at.05 significance level.

The diagram of confirmatory factor analysis is given below. (Figure 1)

Figure 1. Diagram of the confirmatory factor analysis for the vitamin D health belief scale

Standardized factor loads, t values, and explanatory (R^2) values of the items are given below (Table:3).

The reliability analysis of the scale was conducted, and the alpha coefficient was found to be.884. The item analysis regarding the effect of items on internal consistency is given below (Table 4)

The difference of the scale scores between the Lower 27% group and the Upper 27% group is given below (Table 5)

***Table 1**. Factor structure of the vitamin D health belief scale*

Dimension	Factor load
Self-efficacy (Eigenvalue =8.887; Explained variance=12.405; Alpha=0.868)	
1. I can sunbathe correctly.	0.791
2. I can sunbathe at the appropriate time and duration (I sunbathe my face, arms, and legs for 10-15 minutes 2-3 times a week).	0.789
3. I can prevent fractures stemming from vitamin D deficiency.	0.767
4. I know the steps that I need to take to protect my bone health.	0.761
5. I believe that I can feed on foods that are rich in vitamin D (salmon, shrimp, mushrooms, liver, milk, yogurt, etc.).	0.707
Caring (Eigenvalue =3.167; Explained variance =11.770; Alpha=0.850)	
1. Suffering from vitamin D deficiency is a serious problem for me.	0.762
2. I am worried that vitamin D deficiency is a common problem in society.	0.740
3. I am worried about the damages that will occur due to vitamin D deficiency in the future.	0.666
4. Vitamin D deficiency can cause other diseases in women apart from fractures.	0.666
5. Vitamin D deficiency can lead to disorders, such as cardiovascular diseases, blood pressure, diabetes, and cancer.	0.613
6. If I do not eat enough calcium-containing foods, I'm more likely to have a vitamin D deficiency.	0.540
7. If I consume small amounts of calcium-containing foods, I will suffer from vitamin D deficiency.	0.535
Perceived sensitivity (Eigenvalue =2.055; Explained variance =9.767; Alpha=0.787)	
1. I think I will have vitamin D deficiency at some point in my life.	0.721
2. I think that I will suffer from vitamin D deficiency if I do not benefit from sunlight enough.	0.682
3. I think that vitamin D is necessary for my bone health.	0.680
4. As a woman, I am very likely to suffer from vitamin D deficiency.	0.625
5. My vitamin D absorption may slow down as I get older.	0.577
Perceived benefits (Eigenvalue =1.457; Explained variance =9.337; Alpha=0.815)	
1. If I do not suffer from vitamin D deficiency, I will not experience osteoporosis.	0.750
2. If I use milk and dairy products (yogurt, buttermilk, cheese, etc.) regularly, I will not suffer from vitamin D deficiency.	0.718
3. If I get enough vitamin D, my bones are less likely to break when I fall.	0.672
4. If I eat foods rich in vitamin D (salmon, shrimp, mushrooms, milk, yogurt, egg yolk, etc.), I will be less likely to suffer from vitamin D deficiency.	0.665
5. If I sunbathe my face, arms, and legs for 10-15 minutes 2-3 times a week, I will be less likely to suffer from vitamin D deficiency.	0.497
Perceived barriers (Eigenvalue =1.294; Explained variance =8.598; Alpha=0.755)	
1. I do not have the opportunity to sunbathe in my living environment.	0.807
2. It is not possible for me to sunbathe for 15-20 minutes a day.	0.740
3. I do not like sunbathing (in open areas, such as pools, seaside, balcony, park, etc.).	0.699
4. My dressing style prevents me from taking advantage of sunlight.	0.670
5. I sometimes overlook the importance of the sun for vitamin D synthesis.	0.588
Health motivation (Eigenvalue =1.188; Explained variance =6.343; Alpha=0.733)	
1. I would like my vitamin D deficiency to be determined early.	0.788
2. Maintaining my bone health is very important to me.	0.779
3. I take care to eat foods rich in vitamin D (salmon, fish, shrimp, mushrooms, yogurt, milk, etc.).	0.448
4. I seek new information to protect and improve my health.	0.419

Total variance =%58.22; General reliability (Alpha)=0.884ww

***Table 2.** The goodness of fit indices obtained as a result of confirmatory factor analysis for the vitamin d health belief scale*

Index	Normal value	Acceptable value	Vitamin D Health Belief Scale
χ2/sd	<2	<5	2.07
GFI	>0.95	>0.90	0.90
AGFI	>0.95	>0.90	0.90
CFI	>0.95	>0.90	0.91
RMSEA	<0.05	<0.08	0.05
RMR	<0.05	<0.08	0.07

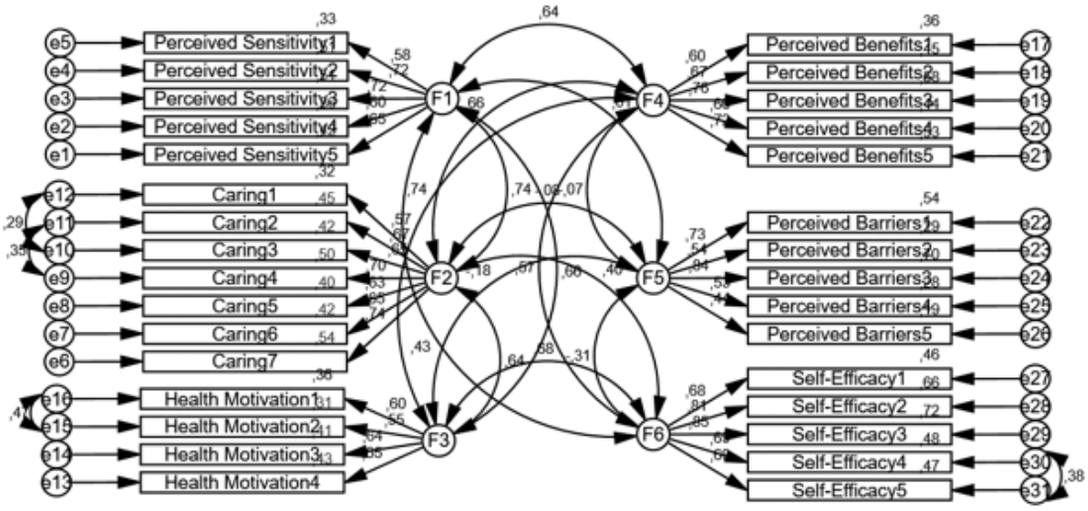

Figure 1. *Diagram of the confirmatory factor analysis for the vitamin d health belief scale*

Table 3. *Factor loads of the vitamin D health belief scale and regression coefficients for the items*

Items		Factor	β	Std. β	S. Error	t	P	R^2
Perceivedsensitivity5	<—-	F1	1,000	0,647				0,470
Perceivedsensitivity4	<—-	F1	1,021	0,603	0,101	10,106	p<,001	0,478
Perceivedsensitivity3	<—-	F1	1,069	0,717	0,092	11,565	p<,001	0,716
Perceivedsensitiviyt2	<—-	F1	1,213	0,717	0,105	11,567	p<,001	0,655
Perceivedsensitivity1	<—-	F1	1,000	0,579	0,102	9,770	p<,001	0,457
Caring7	<—-	F2	1,000	0,735				0,544
Caring6	<—-	F2	0,976	0,648	0,081	12,072	p<,001	0,463
Caring5	<—-	F2	0,876	0,632	0,074	11,774	p<,001	0,700
Caring4	<—-	F2	0,971	0,704	0,075	13,015	p<,001	0,523
Caring3	<—-	F2	0,978	0,649	0,081	12,062	p<,001	0,538
Caring2	<—-	F2	0,975	0,674	0,078	12,433	p<,001	0,525
Caring1	<—-	F2	0,849	0,565	0,081	10,472	p<,001	0,440
Healthmotivation4	<—-	F3	1,000	0,653				0,576
Healthmotivation3	<—-	F3	1,002	0,641	0,098	10,183	p<,001	0,452
Healthmotivation2	<—-	F3	0,639	0,553	0,071	9,007	p<,001	0,447
Healthmotivation1	<—-	F3	0,745	0,603	0,077	9,684	p<,001	0,463
Perceivedbenefits1	<—-	F4	1,000	0,604				0,439
Perceivedbenefits2	<—-	F4	1,097	0,672	0,104	10,569	p<,001	0,410
Perceivedbenefits3	<—-	F4	1,221	0,759	0,107	11,451	p<,001	0,426
Perceivedbenefits4	<—-	F4	1,118	0,663	0,107	10,470	p<,001	0,477
Perceivedbenefits5	<—-	F4	1,167	0,725	0,105	11,123	p<,001	0,454
Perceivedbarriers1	<—-	F5	1,000	0,734				0,422
Perceivedbarriers2	<—-	F5	0,803	0,538	0,083	9,661	p<,001	0,496
Perceivedbarriers3	<—-	F5	1,192	0,837	0,091	13,073	p<,001	0,469
Perceivedbarriers4	<—-	F5	0,791	0,534	0,083	9,583	p<,001	0,420
Perceivedbarriers5	<—-	F5	0,596	0,439	0,075	7,916	p<,001	0,541
Self-efficacy1	<—-	F6	1,000	0,676				0,436
Self-efficacy2	<—-	F6	1,273	0,810	0,091	13,939	p<,001	0,514
Self-efficacy3	<—-	F6	1,276	0,846	0,089	14,370	p<,001	0,514
Self-efficacy4	<—-	F6	1,050	0,691	0,086	12,191	p<,001	0,482
Self-efficacy5	<—-	F6	0,987	0,685	0,082	12,095	p<,001	0,419

Table 4. *Item analysis*

	Scale score when the item is removed	Variance when the item is removedz	Item-total correlation	Cronbach's alpha when the item is removed
Perceivedsensitivity1	109,3193	224,630	,490	,879
Perceivedsensitivity2	109,0297	222,873	,561	,877
Perceivedsensitivity3	108,7450	225,491	,547	,878
Perceivedsensitivity4	109,3094	226,244	,448	,880
Perceivedsensitiviyt5	109,1386	224,685	,554	,878
Caring1	109,4307	224,931	,469	,879
Caring2	109,3515	221,315	,609	,876
Caring3	109,4183	223,549	,511	,878
Caring4	109,3020	223,541	,565	,877
Caring5	109,5124	225,551	,492	,879
Caring6	109,3886	224,258	,488	,879
Caring7	109,1955	223,944	,559	,878
Health motivation1	108,7178	227,474	,517	,879
Health motivation2	108,6064	229,371	,475	,880
Health motivation3	109,1881	225,285	,464	,879
Health motivation4	109,1634	224,946	,487	,879
Perceived benefits1	109,3738	225,972	,460	,879
Perceived benefits2	109,1906	223,455	,553	,878
Perceived benefits3	109,1906	222,854	,583	,877
Perceived benefits4	109,5545	224,347	,504	,879
Perceived benefits5	109,2203	222,693	,588	,877
Perceived barriers1	110,3342	239,816	,005	,890
Perceived barriers2	110,1139	237,287	,060	,890
Perceived barriers3	110,2450	237,292	,067	,889
Perceived barriers4	110,4233	241,471	-,043	,892
Perceived barriers5	110,1807	233,508	,179	,886
Self-efficacy1	109,2772	226,275	,454	,880
Self-efficacy2	109,4282	225,913	,435	,880
Self-efficacy3	109,4629	226,428	,439	,880
Self-efficacy4	109,4678	224,915	,485	,879
Self-efficacy5	109,4282	226,201	,471	,879

Table 5. *Differentiation of Health Belief Scores Regarding Vitamin D According to the Lower 27%-Upper 27% Groups*

Gruplar	Lower%27 (n=110)		Upper %27 (n=110)		t	sd	p
	Ort	Ss	Ort	Ss			
Self – efficacy	2,960	0,788	4,200	0,725	-12,143	218	,000
Caring	2,887	0,614	4,373	0,437	-20,666	218	,000
Perceived sensitivity	3,231	0,789	4,551	0,415	-15,533	218	,000
Perceived benefits	2,967	0,680	4,366	0,530	-17,012	218	,000
Perceived barriers	2,744	0,901	3,158	0,938	-3,342	218	,001
Health motivation	3,530	0,856	4,643	0,370	-12,526	218	,000
General Health Belief Regarding Vitamin D	3,027	0,355	4,211	0,245	-28,826	218	,000

Independent Groups T-Test

Scale scores show significant differences between the Lower 27% group and the Upper 27% group (p<.05). This finding shows that the scale makes discriminative measurements.

4. DISCUSSION

One of the important health problems in women in adulthood is vitamin D deficiency and the emergence of related problems (28). For this reason, it is important for public health nurses to determine individuals' vitamin D health belief levels in society and to plan health-protective and improving programs for both the individual and society. There are many scales that measure the health beliefs of individuals in different periods in society (15,29,30). The fact that this scale is based on a model and that it addresses health beliefs about vitamin D is thought to be useful and practical, especially for public health nurses and other health workers. The health belief model explains the determining factors related to the implementation of preventive health behaviors (31,32). Six domains of HBM (perceived sensitivity, caring, health motivation, perceived benefits, perceived barriers, and self-efficacy) help determine the individual's vitamin D health beliefs (33)

The scale developed in this study was found to have a six-factor structure (Table 1). These factors are compatible with HBM. They can be used as a whole, or they can be considered separately. Perceived self-efficacy, which is the first factor, is the level of confidence that the individual perceives in fulfilling preventive health behaviors. This is important in terms of women's beliefs that they can benefit from vitamin D. Caring, which is the second factor, is the individual's perception of the consequences of vitamin D deficiency as a threat. This is the conclusion women draw based on the consequences of their vitamin D deficiency. This affects the perception of seriousness/caring. The third factor is perceived sensitivity. The individual's feeling that he/she can be sick means perceiving vitamin D deficiency as a threat. The fourth factor is perceived benefit. It is about believing in the recommended actions to reduce the risks associated with vitamin D deficiency. The fifth factor is perceived barriers. This dimension is related to the obstacles that the individual perceives at various levels, including both the individual and societal levels, in maintaining preventive health behaviors. The last factor is health motivation. It defines the compelling conditions created for the individual to start health behaviors. Participants' mean scores on self-efficacy, caring/seriousness, perceived sensitivity, and perceived benefits were found to be high. Results showed that participants in the study had good vitamin D health beliefs. Results regarding sub-dimensions showed that participants had some barriers in the level of taking/benefiting from vitamin D and that they had inadequate motivation to maintain positive health behaviors. This suggests that they had barriers to obtaining vitamin D and that they did not have enough motivation to maintain positive health behaviors.

This newly developed scale is expected to achieve two features, namely validity and reliability. The validity of a scale is a concept related to whether a test or scale actually measures the feature it intends to measure. When it is considered in this way, a scale is said to have validity if it measures the feature it intends to measure fully and accurately without confusion with other features. The psychometric properties of the scale showed that it was valid and reliable. Experts were consulted for content validity, factor analysis was performed for construct validity, and internal consistency measurements of the total scale and all sub-factors were found to be high (34-36).

The construct validity of the scale was analyzed by using exploratory factor analysis. However, before the analysis is carried out, it is necessary to test whether the sample is adequate. To do this, the varimax method was chosen to ensure that the relationship between the factors remained the same. As a result of the factor analysis, the variables were gathered under 6 factors with a total explained variance of 58.22%. The higher the total variance ratios of a scale are, the stronger the factor structure of the scale is. In the literature, it is recommended that the common factor variances of items should be greater than 0.66 and as much close to 1.00 as possible. However, since it is difficult to meet this condition in practice, a total explained variance by factor loads between 40 and 60 is considered adequate (25)

Confirmatory factor analysis is a type of structural equation model (SEM) that can measure the relationship between observed and latent variables (34). Confirmatory factor analysis is used to validate a scale whose factor structure has been established. The decision about validity is made according to the goodness of fit indices following the confirmatory factor analysis. In the study, the most frequently used goodness of fit indices in studies in the literature were used. In addition to the goodness of fit values, the correlation coefficient between the factors should be less than.85. The discriminant validity, which shows that factors diverge from each other, should be achieved. In addition, factor loadings should be high, error variances should be low, and the explanatory (R^2) values of the items on factors should be high (33-36).

The fit statistics calculated by using confirmatory factor analysis showed that the model was compatible with the real data collected from the participants at an acceptable level. This indicated that the scale fitted the explanatory factor structure determined before well. Content validity is the indicator of whether the items on the measurement tool adequately represent the behavior/feature to be measured in terms of quantity and quality (37). One of the rational ways to test content validity is to consult experts. For this purpose, the items of the scale were submitted to expert opinions for content validity. Scores obtained from experts were evaluated with the content validity index (CVI). According to a study in the literature, the CVI value should be at least 83%, and according to another, it should be between 90-100% (38). The CVI value in this study was found as 91.52%, which showed that the scale had very good content validity.

Reliability shows how accurately the scale measures the quality that is intended to be measured and the consistency between the answers given by the individuals to the scale items. Reliability is a measure of time-dependent invariance and is a factor affecting the validity of a test (21). Every valid

scale is reliable, but not every reliable scale is valid (15). One of the most commonly used methods to measure internal consistency for reliability is the calculation of Cronbach's alpha coefficient. The higher the alpha coefficient is, the higher the internal consistency of the scale is said to be (32). In the literature, it is stated that an alpha coefficient between 0.60-0.80 proves the reliability of the scale, and a value between 0.80-1.00 indicates that the scale has high reliability (22,32). Cronbach's Alpha value of the scale developed in this study was found as 0.884, which indicated that the internal consistency of the scale was adequate (38,39).

Reliability analysis was applied to determine the internal consistency of the scale. Reliability analysis shows whether the items on the scale are consistent with each other and with the overall scale. It also determines whether all subjects understand scale expressions in the same way. Reliability is the consistency between the answers given by the participants to the scale items (32). In the literature, the reliability (internal consistency) of the scale is commonly determined by using Cronbach's Alpha coefficient. This coefficient is interpreted as follows:.00 ≤ α <.40, the scale is not reliable;.40 ≤ α <.60, the scale has low-reliability;.60 ≤ α <.80, the scale is quite reliable;.80 ≤ α < 1.00, the scale is highly reliable (31,32).

Responses to items are expected to have a positive correlation with the items and the total scale. This shows that participants understand the propositions correctly and give objective answers. When an item on a scale has a correlation coefficient of ≥.3 with the total items, it indicates that it has a high discrimination power (40). Scale scores differ significantly between the Lower 27% group and the Upper 27% group (p<.05). This finding shows that the scale makes distinctive measurements (Table 5).

5.CONCLUSION

The findings of this study showed that the scale developed in the study was appropriate for determining the health beliefs of adult female individuals about vitamin D. It is thought that the scale will provide support for the evaluation of women's health beliefs about vitamin D and health education and counseling to be given to women. On the other hand, since there are no similar scales in the literature, it is thought that the scale developed in the present study will be a reference for studies to be carried out on the topic. The vitamin D health beliefs scale in women was determined to be a valid and reliable measure; however, it may still require a retest procedure. A retest evaluation can be done to strengthen the validity of the scale.

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