



KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING VITAMIN D DEFICIENCY AMONG ANTENATAL MOTHERS IN TAMILNADU

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ABSTRACT

Our main aim is to explore the knowledge, attitude and practice of vitamin D supplementation among pregnant mothers. The study design is descriptive study and was carried out in Antenatal Out Patient Department, SRM Medical College Hospital and Research Centre, Kattankulathur, Tamilnadu. Eighty six (86) Samples were selected by simple purposive sampling technique between May to November 2014. Structured questionnaire was used to collect the data from samples. The collected data was analyzed by using descriptive statistics. Result showed Forty-eight (48%) of antenatal mothers were in the group of 26 to 30 years. Thirty nine (39%) had studied up to graduate level. Most of them were house maker (86%). Ninety three (93%) of them were joint family. Thirty three (33%) had monthly income of Rs.15188-30374. Majority of them ninety two (92%) were non vegetarian. Sixty seven (67%) of them are primi mothers. None of them were taking vitamin D supplements during antenatal period. 43% of them were using a cosmetic cream containing sun protection factor (SPF) more than 8, without their knowledge. Fifty three (53%) of them got knowledge of vitamin D from the books and magazine. The majority of subjects forty four (44%) were able to recognize sunshine as a source of vitamin D and forty eight (48%) of the subjects did not know the source of the vitamin D. The majority of the study participants had limited knowledge, poor practices, and did not have positive attitude towards benefits of vitamin D supplements. To improve in this situation mother should be educated about importance of vitamin D in planned health education interventions.

KEYWORDS: Vitamin D, Deficiency, Knowledge, attitude and practice



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INTRODUCTION

The world is currently facing an unrecognized and pandemic of vitamin D deficiency. It is a significant public health problem in both developed and developing countries, including India. In spite of being a tropical country with abundant sunshine, vitamin D deficiency is quite prevalent in India. High prevalence of vitamin D deficiency is seen in women of child bearing age and during pregnancy and nursing mothers. (Adekunle Dawoda et.al 2013)¹ Vandana et al stated that in north Indian 66% of infants and 81.1% of mothers have high prevalence of Vitamin D deficiency.² Vitamin D deficiency is common during pregnancy especially among high risk groups, including vegetarian women with limited sun exposure and ethnic minorities especially those with darker skin. Newborn vitamin D levels are largely dependent on maternal Vitamin D status. Consequently infants of mothers are with or at high risk of Vitamin D deficiency. (ACOG 2011)³ Maternal vitamin D deficiency is associated with detrimental effects on the fetus/infant as well as complications for the mother during pregnancy. Fetal and neonatal risks include intrauterine growth retardation, neonatal hypocalcemic seizures, impaired postnatal growth, and rickets in infancy and cardiomyopathy and bone mineralization in later life of period. Future risk of immune-mediated conditions like atopy, asthma and type 1 diabetes may also have a relation to vitamin D deficiency. Lower levels of Vitamin D in mother have been associated with increased rates of cesarean delivery, bacterial vaginosis and pre eclampsia as well as less efficient glucose metabolism. Vitamin D receptors in uterine muscle could affect contractile strength, and vitamin D has been shown to have immunomodulatory effects, thereby potentially protecting the host from infection. (Merewood et.al 2009)⁴. Fetus needs an increase level of Vitamin D during the later half of pregnancy, when bone growth and ossification are most prominent. Vitamin D travels to the fetus by passive transfer, and the fetus is entirely dependent on maternal stores.⁵ To prevent congenital deafness due to premature birth,

birth asphyxia, and low birth weight and infantile Pneumonia adequate supplement of vitamin D in all pregnant women should be considered. (Mahendra K Taneja, 2012)⁶ To improve maternal and fetal vitamin D status during pregnancy, several health agencies have recommended vitamin D supplementation for pregnant women. However, there is significant variation in the dosage recommendations and the effects and safety of vitamin D supplementation during pregnancy are undergoing review. Institute of medicine (2011)⁷ suggests that pregnant and lactating women require at least 600IU/d of vitamin D and recognize that at least 1500–2000 IU/d of vitamin D may be needed to maintain a blood level of 25(OH) D above 30ng/ml. In Indian women calcium intakes was low and the demands on calcium economy are high because of repeated cycles of pregnancy and lactation. At present, vitamin D supplementation is not a part of antenatal care programs in India. There is a growing concern about the health consequences of the high prevalence of vitamin D deficiency worldwide among the general population, including pregnant women.⁸ Vitamin-D deficiency causes rickets and osteomalacia due to inadequate exposure of sunlight, dietary calcium deficiency and fluoride interaction syndromes. These are commonest disorders responsible for bone disease and deformities, caused by endemic skeletal fluorosis. Vitamin-D deficiency causes rickets in children and osteomalacia in the mothers that are commonest disorders prevalent in the rural population of India. Vitamin D deficiency and its complications are preventable during antenatal period as well as their off spring .If the mother is enriched with vitamin D knowledge along with antenatal nutritional education program to the mothers.⁹

MATERIALS AND METHODS

This study was quantitative approach and descriptive research design in nature. The target population of the survey comprised all pregnant women attending in SRM Medical College Hospital and Research Centre Antenatal OPD, Kanchipuram district,

Tamilnadu. Samples are collected by purposive sampling technique and structured questionnaire was used to collect the data from samples. The proforma contains a general questionnaire about socio-demographic and socioeconomic characteristics, diseases and medication and use of food supplements was completed in a face-to-face interview conducted by the investigator. For all women included in the study, body mass index (BMI) was obtained from weight and height recorded during the first prenatal consultation at the beginning of the first trimester of pregnancy. First trimester BMI was used as a proxy for pre pregnancy BMI, and Knowledge attitude and practice on vitamin D supplementation was collected from all registered antenatal mothers. The collected data was analyzed by using descriptive statistic.

SAMPLING CRITERIA

Inclusion criteria

All pregnant mothers
Indian Nationality
Age above 18 year
Live fetus
Parity between one to five

Registered Antenatal mothers

Exclusion criteria

Chronic liver disease
Renal disease
Treatment with anti tubercular / anti epileptic drug

Data collection procedure

This study was conducted after obtaining approval of an institutional ethical committee of SRM University. Oral concern was obtained from the mothers before administering questionnaire..The investigators introduce her to the subjects and explained the objectives of the study. The data was collected from the antenatal mothers by structured questionnaire from all antenatal mothers

Data analysis

Data collected from 86 subjects were organized in master sheets. Demographic data was analyzed using frequency and percentage. Knowledge, Attitude and practice score was analyzed by computing frequency and percentage. Analyzed data will be presented in the form of tables, figures.

RESULTS

Table 1
Description of the demographic characteristics of the samples in pregnant women

S.No	Demographic variables	Frequency(N=86)	Percentage
1	Age in years		
	Less than 21	4	4%
	21-25	32	38%
	26-30	41	48%
	31-35	7	8%
	35 above	2	2%
2	Educational status		
	Profession	3	4%
	Graduate/PG	33	39%
	HSc/diploma	26	30%
	High school	20	24%
	Middle/primary school	1	1%
	Primary school	2	1%
	Illiterate	1	1%
3	Occupation		
	Profession	-	-
	Semi profession	1	1%
	Clerical / shop owner/ farmer	11	12%
	Skilled worker	1	1%
	Unskilled worker	-	-
	Housewives	73	86%
4	FamilyIncome(Modified kuppuswamy socio economic scale)		
	Above 30375	12	14%
	15188- 30374	28	33%
	11362- 15165	6	7%
	7593 – 11362	27	32%
	4555 – 7593	-	-
	4556- 1520	-	-
	1520	-	-
5	Type of family		
	Nuclear family	7	7%
	Joint family	79	93%
	Extended family		
6	Trimester		
	I	16	19%
	II	37	43%
	III	33	38%
7	Eating habits		
	Vegetarian	5	5%
	Lacto- vegetarian		
	Lacto ova vegetarian	3	3%
	Non vegetarian	78	92%
8	Order of pregnancy		
	Gravida 1	37	67%
	Gravida 2	26	30%
	Gravida 3	2	2%
	Gravida 4	1	1%
9	Taking vitamin D supplements		
	Yes	-	-
	No	86	100%

Table 1 describes the demographic characteristic of the samples. Major findings of the study are half of the (48%) antenatal mothers were in the group of age between 26 to 30 years, minor portion of the subjects (8%) were elderly primi and 2% of them were in advanced age group. In the overall (N = 86) subjects were participated. Educational status of the pregnant mothers was studied. In that 3/4th of them were diploma, graduate and professionals. Remaining subjects were completed their primary, high school level and only one subject is illiterate. In the occupation status majority of them were home maker (86%). In the type of family concern 93.3% of them were joint family and others are nuclear family. 33% had income of 15188-30374. Maximum subjects (92%) were non vegetarian. Highest subjects were (67%) primi mothers, 30% of them were second gravid, 2% of them were gravid three and only one subject is fourth gravida. None of them were taking vitamin D supplements during antenatal period.

Table 2
Sun exposure behavior of the samples in pregnant mothers

S.No	Response	Frequency (N =86)	Percentage %
1	Exposed to sun		
	Yes	83	97%
	No	3	3%
2	Sun exposure time		
	Below 30 min	36	42%
	30 min Above	20	24%
	More than 1 hr	27	31%
	Not exposed	3	3%
3	Wearing full sleeved shirt /pant		
	Yes	8	9%
	No	78	91%
4	Covering of arms while working		
	Yes	6	7%
	No	80	93%
5	Wearing cap/ umbrella		
	Yes	14	16%
	No	72	84%
6	Use of cosmetic cream contain SPF more than 8		
	Yes	37	43%
	No	49	57%
7	Use of sunscreen lotion		
	Yes	4	5%
	No	82	95%
8	Frequency of use cosmetic cream		
	Once a day	22	26%
	Twice a day	15	18%
	More than 2	Nil	
	Not using	49	56%
10	Duration of use		
	1-5 yrs	22	26%
	6-10 yrs	10	12%
	Above 10 yrs	5	6%
	No	49	56%

Table 2 express the sun exposure behavior of the samples as follows, In that Utmost of them (97%) were exposed to the sun. Half of the subjects (42%)of them are exposed below 30 mints , 24% of them exposed above 30 minutes and 31% of them exposed more than one hr. while working under the sun 9 % of them were wearing full sleeved pant and shirt and others(93%) not covering their arm. Only 5% were only using sunscreen lotion but 43% of them were using cosmetic cream containing SPF >8 without their knowledge in that 26 % of them using once a day and 18% of them using twice a day. Very few subjects (6%) were using cosmetic cream contain SPF more than 10 years, 12% of them using 6 to 10 years and 26% of them using 1 to 5 years.

Table 3
Knowledge of vitamin D on samples in pregnant women

S.No	Knowledge of vitamin D	Frequency (N= 86)	Percentage (%)
1	Heard of vitamin D		
	Yes	51	59%
	No	35	41%
	Total	86	100
2	Sources of knowledge		
	Family members	1	1%
	Doctor	1	1%
	Nurse	5	6%
	Internet	5	6%
	Book/magazine	46	53%
	Tv /Radio	2	2%
	Relatives	2	2%
	Others	-	
	No	31	36%
	Total	86	100

Table 3 summaries the knowledge of the vitamin D on the samples as follows. Subjects were heard of vitamin D is 59 % in that half of the subjects (53%) were enriched knowledge of vitamin D through book and magazine, of them were gained knowledge through health care professionals and 2% of them from the mass media.

Table 4
Knowledge on sources of vitamin D

S.No	Response	Frequency (N=86)	Percentage%
	Fruits & vegetables	29	34%
	Water	4	5%
	Mushroom	8*	9%
	Fatty fish	10*	12%
	Vitamin D supplements	14*	16%
	Sun	38*	44%
	Air	1	1%
	Selected cereals	6	7%
	Milk / Diary	16*	19%
	Nuts	20	23%
	Codliver oil	7*	8%
	Chicken	1	1%
	Egg	15*	17%
	Beef	1	1%
	Pork	-	
	Dontknow	41	48%

* indicates correct response

Table 4 denotes the knowledge on source of vitamin D among antenatal mothers as follows. The less number of the subjects were able to mark the correct responses from the source of the vitamin D. The correct sources were picked by subjects as follows mushroom(9%),fatty fish(12%),vitamin D supplements(16%) milk and dairy products(19%),cod liver oil (8%),egg (17%) and sunshine(44%) is the main source of vitamin D . Majority of the subjects were not aware on the source of vitamin D

Table 5
Knowledge on Benefits of vitamin D

S.No	Response	Frequency (N=86)	Percentage
1.	Bone health	25*	29%
2	Immune health	12*	14%
3	Prevents Rickets	14*	16%
4	Vision	12	14%
5	Pregnancy & breast feeding	21*	24%
6	Hair growth	12	14%
7	Diabetes mellitus	2*	2%
8	Cardiovascular health	4*	5%
9	Cognitive health	5*	6%
10	Cancer prevention	10	12%
11	Skin softness	21	24%
12	Calcium absorption	11*	13%
13	Prevent osteoporosis	5*	6%
14	Others		NIL
15	Don't know	45	52%

* indicates correct response.

Table 5 enumerates the knowledge on benefits of vitamin D among antenatal mothers as follows. Most of the subjects (52%) were don't know the benefits of the vitamin D. The remaining participants (48%) were able respond on the benefits of vitamin D. In that very few subjects were able to give correct response on knowledge on benefits on vitamin D, bone health(29%), immune health (14%), prevents rickets(16%), pregnancy and breast feeding(24%), cardiovascular (5%), cognitive (6%), calcium absorption (13%), prevents osteoporosis(6%).

Table 6
Knowledge on daily recommended dosage of vitamin D

S.No	Response	Frequency N(86)	Percentage
1	Don't know	84	98%
2.	200 IU		
3	400IU	2	2%
4	600IU		
5	1000IU		
	Total	86	100%

Table 6 describes the knowledge on daily recommended dosage of vitamin D among antenatal mothers as follows. Majority of the subjects were unaware of the daily recommended dosage of vitamin D during pregnancy and 2% of the health professionals (Doctor and Nurse) had knowledge on daily recommended dose

Table 7
Knowledge on time needed in sun to get adequate vitamin D

S.No	Response	Frequency (N=86)	Percentage %
1	Don't know	60	70%
2	Less than 30 min	10	12%
3	More than 30 min	13	15%
4	More than 1hr	3	3%
	Total	86	100%

Table 7 illustrates the knowledge on time needed in sun to get adequate vitamin D. Majority of the subjects were didn't have knowledge on time to spend to get adequate vitamin D. Very few subjects were had knowledge on time needed in sun to get adequate vitamin D in that 12% of the subjects were said less than 30 minutes, 15% of them said more than 30 minutes and 3% expressed more than 1 hours are needed in sun to get adequate vitamin D.

Table 8
Knowledge on factors affecting vitamin D level among antenatal mothers

S.No	Response	Frequency (N=86)	Percentage %
1	Skin pigment*	19	22%
2	Cloud & shade*	6	7%
3	Time of the day*	10	12%
4	Latitude*	1	1%
5	Season*	8	9%
6	Age*	12	14%
7	Pregnancy/ lactation*	11	13%
8	Fatty diet	4	5%
9	Sunscreen use*	9	10%
10	Vegetarian diet*	3	3%
11	Diary allergy	4	5%
12	Pollution*	9	10%
13	Wind	6	7%
14	Smoking	7	8%
15	BMI*	5	6%
16	Others		NIL
17	Don't know	56	65%
	Total	86	100

Table 8 describes the knowledge on factors affecting vitamin D level among antenatal mothers as follows: 65% of the subjects were not aware on the factors affecting vitamin D level. About 19% identified an incorrect of vitamin D factors affecting vitamin D level. 16% of the participants identified correct response that is skin pigment 22%, cloud and shade 7%, Time of the day 12%, latitude 1%, season 9%, Age 14%, pregnancy and lactation 13%, sunscreen use 10%, vegetarian diet 3%, pollution 9%. All the factors that can influence the amount of vitamin D that people get through the diet and sun light. Not all 86 participants answered every question so percentages are based on those that did. * indicates correct response (16%).

Table 9
Attitude towards vitamin D supplementation

S.No	Statements of Attitude	Strongly agree		Agree		Disagree		Strongly disagree		Don't know	
		F	%	F	%	F	%	F	%	F	%
1	Vitamin D supplements protects the children from softening of the bones (Rickets)	16	19%	19	22%	-	-	-	-	51	59%
2	Vitamin D supplement reduce cancer risk.	3	3%	18	20%			1	1%	64	74%
3	Vitamin D supplement helps to prevent heart disease.	2	2%	12	14%			1	1%	71	82%
4	Vitamin D supplement increases the muscle strength.	7	8%	21	24%	1	1%	1	1%	56	65%
5	Vitamin D supplements make bones healthy and strong.	15	17%	16	19%			1	1%	54	63%
6	Vitamin D reduces the risk of abnormal hardening of the tissue (Multiple Sclerosis)	5	6%	8	9%			2	2%	71	83%
7	Vitamin D decrease the risk of high blood pressure	2	2%	7	8%			2	2%	75	87%
8	Vitamin D reduces the infertility	2	2%	7	8%					77	90%
9	Vitamin D reduces the allergic disorders	2	2%	14	16%			1	1%	74	86%
10	Vitamin D reduces the caesarian delivery	1	1%	2	2%			2	2%	81	94%
11	Vitamin D supplementation during pregnancy reduces language difficulty (Autism) in children	2	2%	6	7%			1	1%	77	90%

Table 9 predicts as follows. Few subjects had positive attitude towards benefits of vitamin D supplementation. Very few subjects were disagreed (1%) and strongly agree (1%) on the vitamin D supplementation protecting the children from rickets. Most of the subjects were in the dialama

Table 10
Practice to prevent vitamin D deficiency

S.No	Practice	Yes		NO	
		Frequency N=86	Percentage%	Frequency N= 86	Percentage %
1	Exposure to sun light	50	58%	36	42%
2	Consuming 1liter of milk	9	10%	77	90%
3	Taking vitamin D supplement	-	-	86	100%
4	Including more sea food in the diet	4	4%	82	96%
5	Not using SPF contain creams	45	52%	41	48%
6	Including mushroom in the diet	10	12%	76	84%

The table 10 describes as follows. All subjects (100%) were not taking vitamin D supplements, most of the subjects were not taking adequate amount of sea foods (96%) , (90%) not consuming 1 liter of milk and inadequate intake mushroom in the diet(84%) during pregnancy period.58% of subjects were exposed to adequate sun light and 52% of subjects were not using SPF contain creams including cosmetic creams. The above factors will enhance the vitamin D absorption and prevent vitamin D deficiency during pregnancy period.

RESULTS

Table 1 describes the demographic characteristic of the samples. Major findings of the study are half of the (48%) antenatal mothers were in the group of age between 26 to 30 years, minor portion of the subjects (8%) were elderly primi and 2% of them were in advanced age group. Educational status of the pregnant mothers was studied. In that 3/4th of them were diploma, graduate and professionals. Remaining subjects were completed their primary, high school level and only one subject is illiterate. In the occupation status majority of them were home maker (86%). In the type of family concern 93.3% of them were joint family and others are nuclear family.33% had income of 15188-30374. Maximum subjects (92%) were non vegetarian. Highest subjects were (67%) primi mothers, 30% of them were second gravid, 2% of them were gravid three and only one subject is fourth gravida. None of them were taking vitamin D supplements during antenatal period. Table 2 express the sun exposure behavior of the samples as follows, In that Utmost of them (97%) were exposed to the sun. Half of the subjects (42%)of them are exposed below 30 minutes , 24% of them exposed above 30 minutes and 31% of them exposed more than one hr. while working under the sun 9 % of them were wearing full sleeved pant and shirt and others(93%) not covering their arm. Only 5% were only using sunscreen lotion but 43% of them were using cosmetic cream containing SPF >8 without their knowledge in that 26 % of

them using once a day and 18% of them using twice a day. Very few subjects (6%) were using cosmetic cream contain SPF more than 10 years, 12% of them using 6 to 10 years and 26% of them using 1 to 5 years. Table 3 summaries the knowledge of the vitamin D on the samples as follows. Subjects were heard of vitamin D is 59 % in that half of the subjects (53%) were enriched knowledge of vitamin D through book and magazine, of them were gained knowledge through health care professionals and 2% of them from the mass media. Table 4 denotes the knowledge on source of vitamin D among antenatal mothers as follows. The less number of the subjects were able to mark the correct responses from the source of the vitamin D. The correct sources were picked by subjects as follows mushroom(9%),fatty fish(12%),vitamin D supplements(16%) milk and dairy products(19%),cod liver oil (8%),egg (17%) and sunshine(44%) is the main source of vitamin D . Majority of the subjects were not aware on the source of vitamin D Table 5 enumerates the knowledge on benefits of vitamin D among antenatal mothers as follows. Most of the subjects (52%) were don't know the benefits of the vitamin D. The remaining participants (48%) were able respond on the benefits of vitamin D. In that very few subjects were able to give the correct response on knowledge on benefits on vitamin D, bone health(29%), immune health (14%), prevents rickets(16%), pregnancy and breast feeding(24%), cardiovascular (5%), cognitive (6%), calcium absorption (13%), prevents

osteoporosis(6%) Table 6 describes the knowledge on daily recommended dosage of vitamin D among antenatal mothers as follows. Majority of the subjects were unaware of the daily recommended dosage of vitamin D during pregnancy and 2% of the health professionals (Doctor and Nurse) had knowledge on daily recommended dose. Table 7 illustrates the knowledge on time needed in sun to get adequate vitamin D. Majority of the subjects were didn't have knowledge on time to spend to get adequate vitamin D. Very few subjects were had knowledge on time needed in sun to get adequate vitamin D in that 12% of the subjects were said less than 30 minutes, 15% of them said more than 30 minutes and 3% expressed more than 1 hours are needed in sun to get adequate vitamin D. Table 8 describes the knowledge on factors affecting vitamin D level among antenatal mothers as follows: 65% of the subjects were not aware on the factors affecting vitamin D level. About 19% identified an incorrect of vitamin D factors affecting vitamin D level. 16% of the participants identified correct response that is skin pigment 22%, cloud and shade 7%, Time of the day 12%, latitude 1%, season 9%, Age 14%, pregnancy and lactation 13%, sunscreen use 10%, vegetarian diet 3%, pollution 9%. All the factors that can influence the amount of vitamin D that people get through the diet and sun light. Table 9 predicts as follows. Most of the subjects did not have a positive attitude towards benefits of vitamin D supplementation. Very few subjects were agreed (22%) and 19% strongly agree on the vitamin D supplementation protecting the children from rickets. The table 10 describes as follows. All subjects (100%) were not taking vitamin D supplements, most of the subjects were not taking an adequate amount of sea foods (96%), (90%) not consuming 1 liter of milk and inadequate intake mushroom in the diet(84%) during pregnancy period. 58% of subjects were exposed to adequate sun light and 52% of subjects were not using SPF contain creams including cosmetic creams. The above factors will enhance the vitamin D absorption and prevent vitamin D deficiency during pregnancy period.

DISCUSSION

Our study reveals that the low level of Vitamin D knowledge has been found among pregnant mothers. Toher et al¹⁰ reported that (71%) of pregnant women had insufficient knowledge about vitamin D and its sources. Our study reveals that 59% of the subjects were heard of vitamin D, in that half of the subjects have enriched knowledge of vitamin D through books and magazines, Al Baathi et al¹¹ from Kuwait found that the majority of patients (85.5%) agreed about the importance of sunshine as a source of vitamin D and 60.0% thought that they can get vitamin D from the nutrients. Regarding the main sources of knowledge about vitamin D, 40.5 % of patients got knowledge from doctors, 12.5% from the media, 29.0% from relatives and friends, 8.5% from background information and 9.5% from journals and magazines. Goswami R et al¹² reported that Systemic evaluation of 25(OH) D is insufficient in apparently healthy Indian population. Awareness of vitamin D dietary sources is poor among pregnant women, because of lack of awareness of Vitamin D and failure to identify themselves as being at risk of vitamin D deficiency. Considering the barriers identified in this study, supplementation might be important for this population to prevent vitamin D deficiency. With this, knowledge of vitamin D supplementation should also be increased. Very few researches have been undertaken regarding individual's knowledge of supplementation. The National Institute of Nutrition recommends daily dietary intake of 400IU for healthy individuals including pregnant women. In our study it has been found that pregnant women are not practicing the intake of adequate amount of vitamin D through diet so pregnant women might be vitamin D deficient¹³. Exposure to sunlight is essential to good health, especially to obtain adequate vitamin D, which is known as the 'sunshine vitamin', as it is mainly produced in the skin by exposure to UVB radiation from sunlight (Holick, 2008)¹⁴. However, exposure to sunlight also causes many adverse effects, such as eye damage, skin damage - wrinkles and freckles, and also a major risk factor for

skin cancer (Moyal, 2012)¹⁵. Humans obtain vitamin D mainly by cutaneous synthesis through UV radiation. For most individuals, about 90% of circulating levels of 25(OH) D are derived from sun exposure. The time spent outdoors is an important factor in determining a human's exposure to sunlight, which, in turn, impacts on individual's vitamin D status. Our study reveals that most of the subjects 93% were exposed less than 30 minutes in sun light but not covering their arms and face. According to Godar *et al.* (2011)¹⁶ the outdoor time of adults in the USA was roughly 90 to 100 minutes per day. Nowak *et al.* 15 from Australia reported that 42% of participants spent over 120 minutes per day in the sun and 30% spent between 60 and 120 minutes per day in the sun among 144 adults from a tropical Australian community. In this study it was found that majority of the participants did not have a positive attitude towards benefits of vitamin D supplementation. But other studies reveal that negative attitude toward sunlight and inadequate knowledge on vitamin D could adversely affect the bone health among health care providers and general public. These data provides a basis for developing public health strategies for the prevention of vitamin D deficiency in the pregnant women.^{17,18} Vitamin D deficiency is a major health concern in India, because of notwithstanding the brightly shining sun. The "adequacy of exposure to sunlight of an individual's bare skin" required to photosynthesize vitamin D is grossly ill understood. Darker skin has high melanin content which acts as a natural sunscreen. Therefore, darker skin produces a significantly lesser amount of vitamin D when compared with the individuals with fairer skin, such as Caucasians. Thus, for Indian skin tone, minimum "direct sun exposure" (sun's UV rays wavelength 290–310 nm) required daily is more than 45 min to bare face, arms and legs. Most Indians do not get adequate sun exposure to produce sufficient amounts of vitamin D endogenously. Indian social and / or religious norms related to public modesty dictate that most parts of an individual's body, irrespective of gender, be covered. In big cities a majority of people live in very high population density

areas. They are forced to live in overcrowded tenements, which are closely packed and 3–4 stories high, Consequently direct sunlight does not reach most parts of the inside of the dwelling. Thereby disallowing any sun exposure to an individual in the privacy of one's home. Additionally, lack of space offers limited options for outdoor activities. Atmospheric pollution of metropolitan India also reduces the vitamin D status. Use of sunscreen creams and umbrellas also prevents absorption. The extreme discomfort of the scorching heat associated with most sunny days of Indian summer and the undying desire of most Indians to attain a fairer skin complexion instantly extinguish any desire for sun exposure, and a person's primary focus is on finding ways to avoid the sun, at all costs. In the blazing heat of India these two concerns score very high and the quest for vitamin D sufficiency takes a backseat, always. Therefore, in the Indian scenario, vitamin D sufficiency cannot be attained by depending on adequate sun exposure. ACOG acknowledged that, for pregnant patients "thought to be at increased risk, measurement of total levels can be considered.

CONCLUSION

In summary, our results indicated that the majority of the study participants had limited knowledge, poor practices, and did not have an attitude towards benefits of vitamin D supplements. Due to a severe lack of research in the field of qualitative and socio-cultural studies on KAP regarding vitamin D deficiency, a qualitative KAP study was carried out. Although there were limitations to this study, it was found that gaps in knowledge both in the population and in health care professionals may be a barrier to the prevention of vitamin D deficiency. It is recommended that this is addressed by health promotion campaigns with specific guidelines. Support from health-care professionals is needed to change health behavior. Furthermore, from their accounts we believe that participants were unlikely to experience sufficient sun exposure to prevent vitamin D deficiency. Health care workers may play an important role in communicating health

promoting behaviors to the pregnant mothers. Planned health education interventions on vitamin D and its uses may prevent the vitamin D deficiency among antenatal mothers. This should be included in the routine antenatal nutritional counseling sections. Recommending vitamin D containing supplements may be the best strategy at present for improving vitamin D status with a need for increased vitamin D education. Requirement for Vitamin D is high at particular stages of the lifecycle especially during pregnancy and infancy. Severe vitamin

D deficiency during pregnancy may increase the risk of rickets and deafness in childhood.

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