ISSN: 03875547
Volume 44, Issue 04, August, 2021

Effect of Knowledge and Attitude toward Sun Exposure Related Vitamin D to Lung Function

Rivan Virlando Suryadinata[1*], Sawitri Boengas[1], Amelia Lorensia[2]

Faculty of Medicine, Universitas Surabaya, Jl.Raya Kalirungkut, Surabaya, Indonesia[1]
Faculty of Pharmacy, Universitas Surabaya, Jl.Raya Kalirungkut, Surabaya, Indonesia[2]

Corresponding Author: 1*

Keywords:
Attitude, FEV1/FVC, knowledge, sun exposure, vitamin D

ABSTRACT

Indonesia is a country with a tropical climate with sun exposure throughout the season, because sunlight is the largest source of vitamin D. The risk of vitamin D deficiency can lead to respiratory problems. With good self-management, of course, adequate knowledge and attitudes are needed in overcoming various individual health problems. The purpose was to influence knowledge and attitudes towards sun exposure in meeting the need for vitamin D to improve lung function in healthy respondents without chronic respiratory disorders. The research will be conducted using a cross sectional design, in May-August 2019. The variables were knowledge and attitudes towards sun exposure related to the risk of vitamin D deficiency and lung function by forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC). Respondents used in this study were 168 respondents. Most of the respondents had good level of knowledge (97 of 168), and most of the respondents had good level of attitude (115 of 168). There was relationship between the level of knowledge (p=0.000) and attitude (p=0.000) toward sun exposure levels related to vitamin D and lung function. And there was relationship between the level of knowledge to attitude on sun exposure levels related to vitamin D (p=0.000). Therefore, knowledge and attitudes on sun exposure related to vitamin D were important concerns to maintain healthy lung function.

1. INTRODUCTION

Indonesia is in a tropical climate region with sun exposure throughout the season. Sunlight can produce ultraviolet rays that cannot be seen by the eyes directly, but have benefits for the body [1], [2]. The effects that can be felt from sun exposure can be seen in the short term and long term. Effects that can be caused in the short term such as erythema, photosensitivity and pigmentation are acute. The long-term effects include skin cancer and premature aging [3]. Previous research showed that vitamin D levels were less than 50 nmol/L in participants who still had Indian, Malay and Chinese ancestry [4]. Research in Indonesia shows that many people experience vitamin D deficiency from various backgrounds and ages [2], [5- 8]. Sun exposure is the largest source of vitamin D which is very beneficial for the body apart from food sources

and supplements [9]. Vitamin D consists of two types, namely D2 or ergocarsiferol and vitamin D3 or cholecalciferol. Vitamin D2 or ergocarsiferol can be obtained from supplements and food [10]. Vitamin D3 or cholecalciferol is produced from the synthesis of 7-dehydrocholesterol obtained from sunlight and can be obtained by consuming milk, supplements, yogurt, fish oil, cereals and margarine. Vitamin D which is produced from sunlight, namely UVB rays, has benefits for bone formation and reduces the risk of diseases including arthritis, skin cancer and autoimmune diseases [11], [12].

Although Indonesia is a country that has a great opportunity to be exposed to sunlight, it has a low risk of vitamin D status. Low levels of vitamin D can be influenced by skin color, age, and gender [13]. The risk of vitamin D deficiency can lead to respiratory problems. There's a relationship between vitamin D deficiency related to respiratory disorders such as chronic obstructive pulmonary disease(COPD), tuberculosis and asthma. Respiratory disorders that occur in a person are caused by the immune system in the body inhibiting the production of cytokines, thereby reducing inflammation [14- 16]. Vitamin D which is present in one of the respiratory systems, namely the lungs, will have the effect of changing T cell activity, increasing the secretion of antimicrobial katelecidin peptide, producing chemokines and inhibiting dendritic cell activity. This effect is used to fight infections that can cause lung diseases. If the level of vitamin D in smokers is low, the damage to lung function will be faster [15- 17].

Respiratory disorders that occur greatly affect the quality of life of every affected community [18]. So to improve the quality of life of the community in the health sector and in an effort to prevent the incidence of illness, the government through the health department plans a healthy community movement by making 7 main agendas such as maintaining environmental cleanliness, consuming fruit and vegetables, not consuming alcohol, not smoking, doing physical activity, check their health regularly and maintain the cleanliness of the latrines [19]. This program will never be implemented properly without self-management from within each individual such as controlling thoughts, emotions, behavior and being able to motivate oneself to achieve goals in improving one's own health [20]. With good self-management, of course, adequate knowledge and attitudes are needed in overcoming various individual health problems [21]. The of individuals have less knowledge and attitudes towards health problems. The relationship between knowledge and attitudes related to decreased lung function is very low due to several factors such as education level and living environment [22]. Therefore, this study aimed to influence knowledge and attitudes towards sun exposure in meeting the need for vitamin D to improve lung function in healthy respondents without chronic respiratory disorders.

2. METHODS

The research will be conducted using a cross sectional design, by giving a questionnaire to each respondent to measure differences in knowledge and attitudes related to sun exposure, in May until August 2019. The variables of this study were the level of knowledge and attitudes towards sun exposure related to the risk of vitamin D deficiency and lung function by forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC). This research had received ethical test No.004-OL/KE/V/2019 from Universitas Surabaya Lung function referred to in this study is how well the ability to move air in and out of the lungs and how well oxygen enters the body. Lung function can be measured through spirometry measurements by looking at the FEV1/FVC value, where an FEV1 value of <70% can be said to have impaired lung function. The value of FEV1/FVC is good if the results show ≥0.7 [23], [24]. The requirements that must be considered by each respondent before pulmonary function tests are carried out are as follows: No smoking for an hour before test; Didn't consume alcohol for the previous 4 hours before test; Not doing sports activities for the previous 30 minutes before test; Didn't eat for 2 hours before test; Didn't wear tight clothes; and No medication was taken before [25]. Measurement of lung function using a handheld spirometer where body

mass index (BMI) data in the form of weight and height and respondent data in the form of gender, age, smoker or not are entered into the spirometer. Then the respondent was asked to stand or sit up straight, then the respondent is asked to inhale as deeply as possible through the mouth while closing the nose, then the tube contained in the spirometer is inserted into the mouth, making sure the lips tightly cover the tube wall and the tongue does not cover the tube opening, then breathe out. Exhale as hard and fast as possible in one second until there was no air left in the lungs. Examination with a spirometer can be done 3 times or more to get more accurate results. The results of the spirometer measurement from the respondent will determine whether the respondent has respiratory problems or does not experience respiratory problems based on the FEV1 value. FEV1 value <70% already indicates respiratory problems. So if the value of FEV1 <70%, then it is categorized in the group of respiratory disorders and FEV1 70% is categorized in the group that does not experience respiratory disorders [24], [26], [27].

The knowledge data collection was carried out using a questionnaire that has been used in previous studies [8], [29- 31]. The questions in the questionnaire consist of 11 questions that were structured in the form of open-ended questions and closed-ended questions. The type of data used in this variable used ordinal variable. The assessment of the level of knowledge of the respondents was carried out by calculating the total score of correct answers to each question, each correct answer will be given a score of 1, so that the maximum total correct answer of the respondent is a score of 11. In this study the level of knowledge was categorized into 2, namely the level of knowledge was high if the number was correct 6 items and low level of knowledge if the number of correct answers <6 items.

The attitude data collection was carried out using a questionnaire that has been used in previous studies [8], [29- 31]. The questions in the questionnaire consist of 9 questions that were used to determine attitudes towards sun exposure. The types of data used in this study were ordinal and nominal variables. In this study, the assessment of attitudes related to sun exposure was divided into 2 categories consisting of good attitudes and bad attitudes. Each question asked will be given a score of 2 if the research subject had an attitude that tends to be at risk of vitamin D deficiency. This questionnaire can produce a maximum score of 18 points, if the respondent's answer produces 9 points then it can be categorized as a good attitude, but if >9 points then respondent's attitude was categorized as bad.

The research subjects were young people (≥18 years) as students in the Rungkut District, Surabaya. Sampling technique was done by purposive and consecutive sampling method. The sample size formula that will be used in this study was Lemeshow because it does not know the previous sample population. So the minimum respondents who will be used in the study are 62 respondents. In this study, the questionnaire used was a previous research questionnaire which had been validated twice. The first validation used was content validation, where the questionnaire that has been obtained from the journal was translated into Indonesian first. The second validation was construct validation, where the questionnaire will be distributed to 30 students at the University of Surabaya after which data processing will be carried out using SPSS version 24 software. Reliability was the stability of the results to the extent that a questionnaire that has been measured repeatedly with any method will produce the same results. Reliability was carried out on 20-30 subjects and not included in the sample, then it would be analyzed using the Cronbach's alpha method in the SPSS software.

Data analysis to examine the relationship of knowledge and attitudes on sun exposure related to vitamin D on lung function (ratio FEV1/FVC) using chi-square test. Then the test was also used to analyze the relationship between knowledge and attitudes on sun exposure levels related to vitamin D.

3. RESULTS

3.1 Validity and reliability test results

In testing the validity and reliability of the questionnaire regarding knowledge of sun exposure related to vitamin D, random sampling was carried out on smokers and non-smokers, then 30 respondents were taken. Validity and reliability tests were carried out using SPSS software. The results of the validity test regarding knowledge of sun exposure related to vitamin D, obtained from each question item regarding knowledge of sun exposure related to sun exposure are valid (0.707) because the value of rcount>0.361. So the results of the reliability test carried out at the level of knowledge of sun exposure related to vitamin D were declared reliable.

The results of the validity test regarding attitudes towards sun exposure related to vitamin D obtained from each question item regarding attitudes towards sun exposure related to sun exposure were declared valid (0.620) because the r value was >0.361. So the results of the reliability test carried out on the level of attitude towards sun exposure related to vitamin D were declared reliable.

3.2 Characteristics of Respondents

Respondents used in this study were 168 respondents. The average age of the respondents was 21.60 years. Most of the respondents had normal weight (137 of 168). Most of the respondents had a ratio value of FEV1/FVC <0.7 (155 of 168) which indicated a decrease in lung function (Table 1).

Table 1: Frequency Distribution of Respondents Characteristics

Characteristics		Frequency (n=168)	Percentage (%)
Age (years)	18	10	5.95
	19	17	10.12
	20	20	11.90
	21	31	18.45
	22	32	19.05
	23	32	19.05
	24	15	8.93
	25	11	6.55
BMI (kg/m²)	Thin (≤18,5)	20	11.90
	Normal (18,5-<25)	137	81.55
	Overweight (25,0-<27)	11	6.55
FEV1/FVC value	<0.7	72	42.86
	≥0.7	96	57.14

3.3 Knowledge on sun exposure related to vitamin D

The profile of answers regarding knowledge on sun exposure related to vitamin D can be seen in Table 2. The knowledge classification was divided into good (≥9 points) and bad (<9 points). Most of respondents had good level of knowledge (97 of 168). The results of the different test with chi-square test showed there was a relationship between the level of knowledge on sun exposure levels related to vitamin D and lung function (ratio FEV1/FVC) (P value (0.000)<0.05) (Table 3).

Table 2: Profile of Knowledge Level Answers toward sun exposure related to vitamin D

No		Question	Frequency (n=168)	Percentage (%)
1.	Information about vitamin D	Ever heard	124	73.81
		Never heard	44	26.19
	What is known about vitamin D (**)	Vitamins from the sun	34	88.23
		Vitamins for bone growth	26	15.48
		Vitamins used for immunity	78	46.43

ISSN: 03875547
Volume 44, Issue 04, August, 2021

		Don't know	30	17.86
2.	Source of information about vitamin D (*)	Pharmacists/Nurses/Doctors	12	7.14
		Family	9	5.36
		Book	21	12.50
		School	31	18.45
		Internet	49	29.17
		Friend	32	19.05
		Don't know	14	8.33
3.	Greatest source of vitamin D	Vitamins or Supplements	35	20.83
		Vegetable	30	17.86
		Sun	24	14.29
		Meat	6	3.57
		Egg	33	19.64
		Fish	22	13.09
		Don't know	18	10.71
4.	Benefits of vitamin D	Bone growth and maintenance	91	54.17
		Regulating calcium and phosphorus levels in body	30	17.86
		Immune	33	19.64
		Don't know	14	8.33
5.	Due to vitamin D deficiency (*)	Cancer	66	39.29
		Obesity	11	6.55
		Cholesterol increase	12	7.14
		Bone disease	60	35.71
		High blood pressure	24	14.29
		Don't know	8	4.76
6.	Causes of the body lack of vitamin D (*)	Using an umbrella during the day	77	45.83
		Sunbathing on the beach	7	4.17
		Doing regular physical activity	22	13.10
		Using closed clothes	75	44.64
		Using sunscreen	56	33.33
		Don't know	12	7.14
7.	The sun can help produce vitamin D	Agree	66	39.29
		Don't agree	58	34.52
		Don't know	44	26.19
	Reason	Can be used for bone health	82	48.81
		The sun is the synthesis of vitamin D in body	86	51.19
8.	Sunlight is harmful to the skin	Yes	86	51.19
		No	82	48.81
	The reason (**)	Too hot	63	37.50
		Cause skin cancer if it's too long	29	17.26
		For fear of black	65	38.69
		Don't know	11	6.55
9.	The best time for the body to be exposed to direct sunlight is at... until….	06.00–09.00 a.m	70	41.67
		07.00–09.00 a.m	40	23.81
		10.00 a.m–02.00 p.m	33	19.64
		Afternoon	25	14.88
10.	A good time for the body to get vitamin D from sun exposure	5–15 minutes	51	30.36
		15–30 minutes	60	35.71
		30–60 minutes	39	23.21
		>1 hour	18	10.71
11.	A good amount of SPF for the body	<15	58	34.52
		≥15	73	43.45
		Don't know	37	22.02

*) Respondent's answer can be more than one

**) Open Question

Table 3: Cross-tabulation of Knowledge toward sun exposure levels related to vitamin D

Knowledge level on sun exposure related to vitamin D		Lung Function		Frequency (n=168)	Chi-Square Test
Number of Questions Correct	Category e	<0.7	≥ 0.7		
≥9 points	Good	12	85	97	0.000

<9 points	Bad	60	11	71
		72	96	**168**

3.4 Attitude on sun exposure related to vitamin D

The profile of answers regarding attitude on sun exposure related to vitamin D can be seen in Table 4. The atitude classification was divided into good (≥7 points) and bad (<7 points). Most of the respondents had good level of attitude (115 of 168). The results of the different test with the chi-square test showed that there was a relationship between the level of attitude on sun exposure levels related to vitamin D and lung function (ratio FEV1/FVC) (P value (0.000) <0.05) (Table 5).

Table 4: Profile of Answer Level Attitude toward sun exposure related to vitamin D

No		Question	Frequency (n=168)	Percentage (%)
1.	Frequent trips or walks in direct sunlight	Yes	168	100
2.	Length per day you get sunlight (minutes)	5	26	15.48
		5–15	47	27.98
		20–30	63	37.50
		> 30	32	19.05
3.	Avoid direct sun exposure	Yes	111	66.07
		No	57	33.93
	If yes, why (**)	Avoid the heat or the sun	41	24.40
		Afraid of black	47	27.98
		Don't know	23	13.69
	If not the reason (**)	Sunlight is good for skin and bones	37	22.02
		Lots of outdoor activities	11	6.55
		Don't know	9	5.36
4.	Use skin protection equipment to avoid sun exposure	Yes	156	92.86
		No	12	7.14
	What type of protective equipment is used (**)	Jacket	82	48.81
		Sunblock	14	8.33
		Jacket and sunscreen	8	4.76
		Hat	52	30.95
5.	The reason you use protective equipment	Avoid black skin	90	53.57
		Avoid heat	72	42.86
		Because men are not afraid of heat	6	3.57
6.	Taking vitamin D supplements	Yes	0	0
		No	168	100
7.	The purpose of taking vitamin D supplements	Sufficient vitamin D needs	47	27.98
		Bone growth and maintenance	88	52.38
		Don't know	33	19.64
8.	Opinions about the need for vitamin D in the body	It's enough	89	52.98
		Not enough	79	47.02
	If it is sufficient, the reason (**)	Frequent exposure to the sun	46	27.38
		Often eat vegetables and drink milk	22	13.10
		Feeling never sick	13	7.74
		Give no reason	8	4.76
	If not sufficient, the reason (**)	Never feel pain	24	14.29
		Avoid the sun	38	22.62
		Give no reason	17	10.12
9.	Have an interest in knowing more about vitamin D	Yes	116	69.05
		No	52	30.95
	If yes, the reason	Increase knowledge and insight	66	39.29
		Vitamin D is important for the body	25	14.88
		More want to know about vitamin D	25	14.88

*) Respondent's answer can be more than one

**) Open Question

ISSN: 03875547
Volume 44, Issue 04, August, 2021

Table 5: Cross-tabulation of Attitude toward sun exposure levels related to vitamin D

Attitude level on sun exposure related to vitamin D		Lung Function		Frequency (n=168)	Chi-Square Test
Number of Questions Correct	Category Level of Attitude	<0.7	≥0.7		
≥ 9 points	Good	25	90	115	0.000
< 9 points	Bad	47	6	53	
		72	96	**168**	

3.5 Relationship Knowledge and Attitude on sun exposure related to vitamin D

The results of the different test with the chi-square test showed that there was a relationship between the level of knowledge to attitude on sun exposure levels related to vitamin D (P value (0.000)<0.05) (Table 6).

Table 6: Cross-tabulation of Knowledge and Attitude toward sun exposure related to vitamin D

Attitude level on sun exposure related to vitamin D	Knowledge level on sun exposure related to vitamin D		Frequency (n=168)	Chi-Square Test
	Good (≥9 points)	Bad (<9 points)		
Good (≥7 points)	80	17	97	0.000
Bad (<7 points)	35	36	71	
	115	53	**168**	

4. DISCUSSION

Age was the main factor that affects lung function disorders. Age was related to the aging process where the increasing age of a person, the greater the possibility of a decrease in lung function capacity. There was significant relationship between age and lung function capacity. In addition, with increasing age, the perception and mindset will develop, so that the knowledge gained was getting better [32- 34]. The measurement of the spirometer value carried out in FEV1/FVC value. The limitation of this study was that it did not measure blood levels of vitamin D, because there were several factors other than knowledge and attitudes that can affect lung function. Factors that can affect lung function include:

1. Age. Age appears to be a reinforcing factor. Based on the theory that age can affect knowledge, the older one gets, the easier it is to digest the information obtained. The results obtained in this study differ from the theory, where age does not affect knowledge of sun exposure.
2. Genetics, the influence of genetic factors on pulmonary function, as demonstrated mostly by FEV1 and FVC, has been investigated in several studies. FVC was taken as lung size and FEV1 was taken as airflow rate [35]. The most trusted genetic risk factor at present is a deficiency of 1-antitrypsin which is a major inhibitor of circulating serine proteases. 1-antitrypsin is a serum protein produced by the liver and normally found in the lungs to inhibit the destructive action of the neutrophil elastase enzyme on lung tissue. A decrease in the level of 1-antitrypsin to less than 35% of the normal value (150-350 mg/dL) causes reduced protection of lung parenchyma tissue, destruction of the adjacent alveolar walls, and finally causes a decrease and damage to the lung. The most common genetic variants of 1-antitrypsin are M, S and Z. The M allele's normal while the S and Z alleles are associated with defisiensi1-antitrypsin deficiency. Moderate 1-antitrypsin deficiency is most often caused by the MS and MZ genotypes [36], [37].
3. Smoking, cigarette smoke can cause local damage to the respiratory tract, such as loss of ciliary function. Cilia function as a deterrent to foreign objects, so that foreign objects and other pollutants will not easily enter the lungs. This decrease in ciliary function increases the risk of lung function disorders, because dust and pollutants can easily enter the lungs. This theory clearly states that cigarette smoke can cause a decrease in lung function, so that pulmonary function disorders are not only experienced by active smokers and former smokers, but can also be experienced by passive smokers [38], [39].

Factors that influence the response profile of the level of knowledge and attitudes towards sun exposure related to vitamin D in respondents:

1. Respondents who answered that they'd heard about vitamin D were 124 of 168. Vitamin D was

used for bone growth and respondents who knew that vitamin D was for immunity were 10.26%. The mechanism of vitamin D in bone formation and bone maintenance is by activating calcitriol or 1,25-dihydroxycholecalciferol from 25(OH)D3 to be 10 times more active than vitamin D3 in kidney. This calcitriol will increase the absorption of calcium and phosphorus in bones [12], [40]. At the age of respondent, more information about vitamin D was obtained from the internet (49 of 168) and friends (32 of 168).

2. Most of respondents answered that the largest source of vitamin D came from vitamin D supplements (35 of 168). The answer wasn't correct because the largest source of vitamin D from sun exposure besides vitamins and supplements. Vitamin D2 or ergocarsiferol can be obtained from supplements and food. Meanwhile, vitamin D3 was produced from the synthesis of 7-dehydrocholesterol which was obtained from sunlight and can be obtained by consuming milk, supplements, yogurt, fish oil, cereals and margarine [12], [41].

3. Respondents' answers said that the benefits of vitamin D are for bone health (91 of 168). Benefits of vitamin D is used for growth and maintenance of bones, vitamin D is used to regulate calcium and phosphorus levels in the body, and vitamin D is used for immunity. Vitamin D which is produced from sunlight, namely UVB rays, has benefits for bone formation and reduces the risk of diseases including arthritis, skin cancer and autoimmune diseases [12]. The mechanism of vitamin D in bone formation and bone maintenance is by activating calcitriol or 1,25-dihydroxycholecalciferol from 25(OH)D3 to be 10 times more active than vitamin D3 in the kidney. This calcitriol will increase the absorption of calcium and phosphorus in bones [42].

4. The result of vitamin D deficiency's the occurrence of rickets in children which can be characterized by early symptoms such as osteomalacia, swollen bones forming X and O. There's a close relationship between vitamin D deficiency and decreased lung function. The mechanism of vitamin D in bone formation and bone maintenance is by activating calcitriol or 1,25-dihydroxycholecalciferol from 25(OH)D3 to be 10 times more active than vitamin D3 in kidney. This calcitriol will increase the absorption of calcium and phosphorus in bones [42].

5. Any protective device that interferes with the penetration of UVB radiation can affect the synthesis of vitamin D3 [43]. As sunscreen, general window glass at home or car and clothing, all of them effectively block UVB radiation even in summer, people who work indoors, wear extensive clothing, regularly use sunscreen, dark skin, obesity, aged Continued or consciously avoiding the sun will risk vitamin D deficiency [44], [45]. Sun exposure can be used to help body produce vitamin D in the amount it needs each day. However, for fear of getting skin cancer, most people avoid sun exposure. To prevent vitamin D deficiency, one should spend 15 to 20 minutes daily in the sun with 40% of the skin surface exposed [46].

6. Most respondents said that the best time to be exposed to the sun is 06.00-09.00 a.m (70 of 168) with a duration of 15-30 minutes (60 of 168). Exposure to direct sunlight can be harmful and not harmful, where exposure to sunlight can harm the skin if exposed for too long, triggering skin cancer and exposure to sunlight that does not harm the skin can be used to meet the needs of vitamin D in the body [47]. A good time for the skin to get vitamin D from direct sunlight is 15–30 minutes, because if the body is exposed to excessive sunlight it can trigger skin cancer [48], [49]. Exposure to abundant sunlight with high intensity can cause skin hyperpigmentation so that the skin becomes dull and scaly and can even increase the risk of skin cancer. These effects're mainly caused by UV A and B rays. In small amounts, UV-B radiation's beneficial for the synthesis of vitamin D in the body, but excessive exposure to these rays can cause skin redness/burning and harmful effects of synthesis. free radicals that trigger erythema and cataracts [48,49,50].

7. If the skin's exposed to excessive sunlight, there will be high cumulative ultraviolet (UV) radiation that can damage skin cells, affect the normal growth and appearance of the skin and cause acute skin damage, including aging and burning. In addition, more complicated chronic problems can occur with long-

term exposure, such as skin aging and skin cancer [48- 50]. UV radiation is also responsible for significant eye damage, particularly cataract formation. Sun Protection Factor (SPF) which is good for the body is 15. With an SPF of 15, it's said to be able to absorb 99% of UVB radiation, so that it can reduce the synthesis of vitamin D3 in the skin [51].

8. There's a risk of vitamin D deficiency if a person intentionally avoids sun exposure, because daily sun exposure helps the human body to produce vitamin D in the required amount. The results showed there're still many people who were active outside the room compared to indoors [52], [53].

5. CONCLUSION

There was a relationship between the level of knowledge and attitude toward sun exposure levels related to vitamin D and lung function. And there was a relationship between the level of knowledge to attitude on sun exposure levels related to vitamin D.

6. ACKNOWLEDGMENTS

This research was funded by the Institute of Research and Community Service of the Universitas Surabaya.

7. CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

8. REFERENCES

[1] Nimitphong H, Holick MF. Vitamin D status and sun exposure in southeast Asia. Dermatoendocrinol.2013;5(1):34–7.

[2] Oktaria V, Graham SM, Triasih R, Soenarto Y, Bines JE, Ponsonby AL, et al. The prevalence and determinants of vitamin D deficiency in Indonesian infants at birth and six months of age. PLoS ONE.2020;15(10): e0239603.

[3] Hoel DG, Berwick M, de Gruijl FR, Holick MF. The risks and benefits of sun exposure 2016. Dermatoendocrinol.2016;8(1):e1248325.

[4] Divakar U, Sathish T, Soljak M, et al. Prevalence of Vitamin D Deficiency and Its Associated Work- Related Factors among Indoor Workers in a Multi-Ethnic Southeast Asian Country. Int J Environ Res Public Health.2019;17(164):1–10.

[5] Aji AS, Erwinda E, Yusrawati Y, Malik SG, Lipoeto NI. Vitamin D deficiency status and its related risk factors during early pregnancy: a cross-sectional study of pregnant Minangkabau women, Indonesia. BMC Pregnancy Childbirth.2019;19(183):1–10.

[6] Oktaria V, Triasih R, Graham SM, Bines JE, Soenarto Y, Clarke MW, Lauda M, Danchin M. Vitamin D deficiency and severity of pneumonia in Indonesian children. PLoS One.2021;16(7):e0254488.

[7] Pulungan A, Soesanti F, Tridjaja B, Batubara J. Vitamin D insufficiency and its contributing factors in primary school-aged children in Indonesia, a sun-rich country. Ann Pediatr Endocrinol Metab.2021;26(2):92–8.

[8] Lorensia A, Suryadinata RV, Amir GA. Relation Between Vitamin D Level and Knowledge and Attitude Towards Sunlight Exposure Among Asthma Outpatients in Surabaya. Global Medical & Health

Communication.2019;7(3):162–9.

[9] Trummer C, Pandis M, Verheyen N, et al. Beneficial Effects of UV-Radiation: Vitamin D and beyond. Int J Environ Res Public Health.2016;13(10):1028.

[10] Shieh A, Chun RF, Ma C, et al. Effects of High-Dose Vitamin D2 Versus D3 on Total and Free 25-Hydroxyvitamin D and Markers of Calcium Balance. J Clin Endocrinol Metab.2016;101(8):3070–8.

[11] Polzonetti V, Pucciarelli S, Vincenzetti S, Polidori P. Dietary Intake of Vitamin D from Dairy Products Reduces the Risk of Osteoporosis. Nutrients.2020;12(6):1743.

[12] Bikle DD. Extraskeletal actions of vitamin D. Ann N Y Acad Sci.2016;1376(1):29–52.

[13] Al-Horani H, Abu Dayyih W, Mallah E, et al. Nationality, Gender, Age, and Body Mass Index Influences on Vitamin D Concentration among Elderly Patients and Young Iraqi and Jordanian in Jordan. Biochem Res Int.2016; 2016:8920503.

[14] Gatera VA, Abdulah R, Musfiroh I, Judistiani RTD, Setiabudiawan B. Updates on the Status of Vitamin D as a Risk Factor for Respiratory Distress Syndrome. Adv Pharmacol Sci.2018; 2018:8494816.

[15] Hejazi ME, Modarresi-Ghazani F, Entezari-Maleki T. A review of Vitamin D effects on common respiratory diseases: Asthma, chronic obstructive pulmonary disease, and tuberculosis. J Res Pharm Pract.2016;5(1):7–15.

[16] Kokturk N, Baha A, Oh YM, Young Ju J, Jones PW. Vitamin D deficiency: What does it mean for chronic obstructive pulmonary disease (COPD)? a compherensive review for pulmonologists. Clin Respir J.2018;12(2):382–97.

[17] Bishop E, Ismailova A, Dimeloe SK, Hewison M, White JH. Vitamin D and immune regulation: antibacterial, antiviral, anti-inflammatory. JBMR Plus.2020;5(1):e10405

[18] Miravitlles, M., Ribera, A. Understanding the impact of symptoms on the burden of COPD. Respir Res.2017;18(67):1–11.

[19] Werdhani RA. Medical problem in Asia pacific and ways to solve it: The roles of primary care/family physician (Indonesia Xperience). J Family Med Prim Care.2019;8(5):1523–7.

[20] Berkman ET. The Neuroscience of Goals and Behavior Change. Consult Psychol J.2018;70(1):28–44.

[21] Lorensia A, Setiawan B, Maranatha D, Yudiarso A. Effectiveness of Education Based Information-Motivation-Behavioral Skill (IMB) Model of Improving Knowledge, Motivation, and Performance Demonstration Metered-Dose Inhaler (MDI) to Community Pharmacists in Surabaya. International Journal of Pharmaceutical and Clinical Research.2017;9(7):485–95.

[22] Kumar S, Preetha G. Health promotion: an effective tool for global health. Indian J Community Med.2012;37(1):5–12.

[23] Haynes JM. Basic spirometry testing and interpretation for the primary care provider. Can J Respir Ther.2018;54(4):92–8.

[24] Sim YS, Lee JH, Lee WY, et al. Spirometry and Bronchodilator Test. Tuberc Respir Dis (Seoul).2017;80(2):105–12.

[25] Redlich CA, Tarlo SM, Hankinson JL, Townsend MC, Eschenbacher WL, Von Essen SG, Sigsgaard T, Weissman DN; American Thoracic Society Committee on Spirometry in the Occupational Setting. Official American Thoracic Society technical standards: spirometry in the occupational setting. Am J Respir Crit Care Med.2014;189(8):983–93.

[26] Lamb K, Theodore D, Bhutta BS. Spirometry. [Updated 2021 Feb 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK560526/

[27] Tollånes MC, Sjaastad GE, Aarli BB, Sandberg S. Spirometry in chronic obstructive pulmonary disease in Norwegian general practice. BMC Fam Pract.2020;21(1):235.

[28] GOLD (Global Initiative for Chronic Obstructive Lung Disease. 2021 Global Strategy For Prevention, Diagnosis And Management Of Copd. https://goldcopd.org/2021-gold-reports/

[29] Arora H, Dixit V, Srivastava N. Evaluation of knowledge, practices of vitamin D and attitude toward sunlight among Indian students. Asian J Pharm Clin Res.2016;9(1):308–13.

[30] Al Bathi BA, Al Zayed KE, Al Qenai M, Makboul G, El-Shazly MK. Knowledge, attitude and practice of patients attending primary care centers toward vitamin D in Kuwait. Alexandria J Med.2012;48(3):277–82.

[31] Zhou M, Zhuang W, Yuan Y, Li Z, Cai Y. Investigation on vitamin D knowledge, attitude and practice of university students in Nanjing, China. Public Health Nutr.2016;19(1):78–82.

[32] Rojas M, Mora AL, Kapetanaki M, Weathington N, Gladwin M, Eickelberg O. Aging and Lung Disease. Clinical Impact and Cellular and Molecular Pathways. Ann Am Thorac Soc.2015;12(12):S222–7.

[33] Thomas ET, Guppy M, Straus SE, et al. Rate of normal lung function decline in ageing adults: a systematic review of prospective cohort studies BMJ Open.2019;9:e028150.

[34] Sharma G, Goodwin J. Effect of aging on respiratory system physiology and immunology. Clin Interv Aging.2006;1(3):253–60.

[35] Peng, Y., Zhong, GC., Wang, L. et al. Chronic obstructive pulmonary disease, lung function and risk of type 2 diabetes: a systematic review and meta-analysis of cohort studies. BMC Pulm Med.2020;20(137):1–12.

[36] Brantly, M., Campos, M., Davis, A.M. et al. Detection of alpha-1 antitrypsin deficiency: the past, present and future. Orphanet J Rare Dis.2020;15(96):1–10.

[37] Foreman MG, Wilson C, DeMeo DL, Hersh CP, Beaty TH, Cho MH, Ziniti J, Curran-Everett D, Criner G, Hokanson JE, Brantly M, Rouhani FN, Sandhaus RA, Crapo JD, Silverman EK; Genetic Epidemiology of COPD (COPDGene) Investigators *. Alpha-1 Antitrypsin PiMZ Genotype Is Associated with Chronic Obstructive Pulmonary Disease in Two Racial Groups. Ann Am Thorac Soc.2017 Aug;14(8):1280–7.

[38] Bustamante-Marin XM, Ostrowski LE. Cilia and Mucociliary Clearance. Cold Spring Harb Perspect Biol.2017;9(4):a028241.

[39] Jiang C, Chen Q, Xie M. Smoking increases the risk of infectious diseases: A narrative review. Tob Induc Dis.2020; 18:60.

[40] Goltzman D. Functions of vitamin D in bone. Histochem Cell Biol. 2018;149(4):305–12.

[41] Polzonetti V, Pucciarelli S, Vincenzetti S, Polidori P. Dietary Intake of Vitamin D from Dairy Products Reduces the Risk of Osteoporosis. Nutrients.2020;12(6):1743.

[42] Bikle DD. Vitamin D: Newer Concepts of Its Metabolism and Function at the Basic and Clinical Level, Journal of the Endocrine Society.2020;4(2):1–20.

[43] Kalajian, T.A., Aldoukhi, A., Veronikis, A.J. et al. Ultraviolet B Light Emitting Diodes (LEDs) Are More Efficient and Effective in Producing Vitamin D3 in Human Skin Compared to Natural Sunlight. Sci Rep.2017; 7:11489.

[44] Xiong ZM, Mao X, Trappio M, Arya C, Kordi JE, Cao K. Ultraviolet radiation protection potentials of Methylene Blue for human skin and coral reef health. Sci Rep.2021;11(1):10871.

[45] Diffey BL. Time and Place as Modifiers of Personal UV Exposure. Int J Environ Res Public Health.2018;15(6):1112.

[46] Neale RE, Khan SR, Lucas RM, Waterhouse M, Whiteman DC, Olsen CM. The effect of sunscreen on vitamin D: a review. Br J Dermatol. 2019;181(5):907–15.

[47] Holick MF. Biological Effects of Sunlight, Ultraviolet Radiation, Visible Light, Infrared Radiation and Vitamin D for Health. Anticancer Research March 2016;36(3):1345–56.

[48] Kift R, Rhodes LE, Farrar MD, Webb AR. Is Sunlight Exposure Enough to Avoid Wintertime Vitamin D Deficiency in United Kingdom Population Groups?. Int J Environ Res Public Health.2018;15(8):1624.

[49] Lee YM, Kim SA, Lee DH. Can Current Recommendations on Sun Exposure Sufficiently Increase Serum Vitamin D Level?: One-Month Randomized Clinical Trial. J Korean Med Sci. 2020;35(8):e50.

[50] Solano F. Photoprotection and Skin Pigmentation: Melanin-Related Molecules and Some Other New Agents Obtained from Natural Sources. Molecules.2020;25(7):1537.

[51] Young AR, Narbutt J, Harrison GI, Lawrence KP, Bell M, O'Connor C, Olsen P, Grys K,

Baczynska KA, Rogowski-Tylman M, Wulf HC, Lesiak A, Philipsen PA. Optimal sunscreen use, during a sun holiday with a very high ultraviolet index, allows vitamin D synthesis without sunburn. Br J Dermatol.2019;181(5):1052–62.

[52] Hartley M, Hoare S, Lithander FE, et al. Comparing the effects of sun exposure and vitamin D supplementation on vitamin D insufficiency, and immune and cardio-metabolic function: the Sun Exposure and Vitamin D Supplementation (SEDS) Study. BMC Public Health.2015;15:115.

[53] Lee YM, Kim SA, Lee DH. Can Current Recommendations on Sun Exposure Sufficiently Increase Serum Vitamin D Level?: One-Month Randomized Clinical Trial. J Korean Med Sci.2020;35(8):e50.

TMJ ISSN: 03875547

Submission Deadline
05 Sep 2021 (Vol 44 , Iss 05)

Upcoming Publication
31 Aug 2021 (Vol 44 , Iss 04)

Scopus Link

Teikyo Medical Journal

Teikyo Medical Journal (issn: 03875547) is a scopus indexed medical journal published by Teikyo University School of Medicine since 1990. TMJ welcomes all types of medical journal includes medicine, pharmacy, bio-chemistry, psychology etc.

Teikyo Medical Journal (ISSN: 03875547)

Search for Journal.. Search

TMJ ISSN: 03875547

Submission Deadline
05 Sep 2021 (Vol 44 , Iss 05)

Upcoming Publication
31 Aug 2021 (Vol 44 , Iss 04)

About Us

Teikyo Medical Journal (issn: 03875547) is a scopus indexed medical journal published by Teikyo University School of Medicine since 1990. TMJ welcomes all types of medical journal includes medicine, pharmacy, bio-chemistry, psycology etc.

Peer Review

The process is single-blind for most journals, meaning that the author does not know the identity of the reviewer, but the reviewer knows the identity of the author.

At least two review reports are collected for each submitted article. Suggestions of reviewers can be made by the academic editor during pre-check.

The following checks are applied to all reviewers:

- That they hold no conflicts of interest with the authors, including if they have published together in the last five years;
- That they hold a Ph.D. (exceptions are made in some fields, e.g. medicine);
- They must have recent publications in the field of the submitted paper;
- They have not recently been invited to review a manuscript for the TMJ journal

Broad Scope

The impact of your work will have on researchers outside your field and the potential for greater exposure.

Indexed

Increase visibility, availability, and readership of your work on the internet which attracts good citations.

Open Access

All the articles are available free to download, distribute & share. For more information visit Open Access Information and Policy

Fast Track Peer

To ensure that your next paper for publication is available online for your peers to read and cite as quickly as possible through using our state-of-art **Online Peer Review System consisting of more than 10000 reviewers**

//

TMJ ISSN: 03875547

Submission Deadline
05 Sep 2021 (Vol 44 , Iss 05)

Upcoming Publication
31 Aug 2021 (Vol 44 , Iss 04)

Teikyo Medical Journal Editors-Panel

//

TMJ ISSN: 03875547

Submission Deadline
05 Sep 2021 (Vol 44 , Iss 05)

Upcoming Publication
31 Aug 2021 (Vol 44 , Iss 04)

Archive of Teikyo Medical Journal

Volume - 44 (2021)

Issue - 05 Issue - 04 Issue - 03 Issue - 02
Issue - 01

Volume - 43 (2020)

Issue - 04 Issue - 03 Issue - 02 Issue - 01

Volume - 42 (2019)

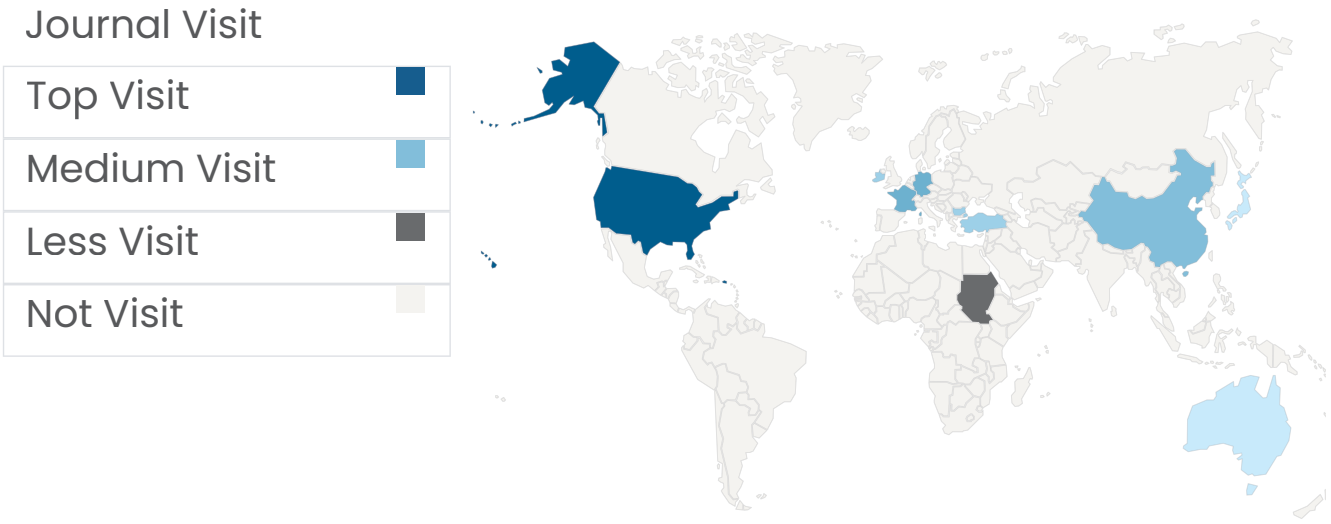
Issue - 04 Issue - 03 Issue - 02 Issue - 01

Volume - 41 (2018)

Issue - 04 Issue - 03 Issue - 02 Issue - 01

Volume - 40 (2017)

Issue - 04 Issue - 03 Issue - 02 Issue - 01



TMJ
ISSN: 03875547

Submission Deadline
23 Jun 2023 (Vol 46 , Iss 06)

Upcoming Publication
30 Jun 2023 (Vol 46 , Iss 06)

Archive- Teikyo Medical Journal

Journal ID : TMJ-07-08-2021-10563
Total View : 473

Title : Effect of Knowledge and Attitude toward Sun Exposure Related Vitamin D to Lung Function

Abstract :
Indonesia is a country with a tropical climate with sun exposure throughout the season, because sunlight is the largest source of vitamin D. The risk of vitamin D deficiency can lead to respiratory problems. With good self-management, of course, adequate knowledge and attitudes are needed in overcoming various individual health problems. The purpose was to influence knowledge and attitudes towards sun exposure in meeting the need for vitamin D to improve lung function in healthy respondents without chronic respiratory disorders. The research will be conducted using a cross sectional design, in May-August 2019. The variables were knowledge and attitudes towards sun exposure related to the risk of vitamin D deficiency and lung function by forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC). Respondents used in this study were 168 respondents. Most of the respondents had good level of knowledge (97 of 168), and most of the respondents had good level of attitude (115 of 168). There was relationship between the level of knowledge (p=0.000) and attitude (p=0.000) toward sun exposure levels related to vitamin D and lung function. And there was relationship between the level of knowledge to attitude on sun exposure levels related to vitamin D (p=0.000). Therefore, knowledge and attitudes on sun exposure related to vitamin D were important concerns to maintain healthy lung function.

Full article

Journal ID : TMJ-06-08-2021-10548
Total View : 453

Title : THE EFFECT OF ADJUVANT THERAPY WITH POLYHERBAL FORMULAS ON IMPROVING THE mMRC SCORE OF PATIENTS WITH MODERATE-GRADE SARS COV-2 PNEUMONIA

Abstract :
Natural Medicines with anti-inflammatory and anti-oxidant potentials act as adjuvant therapy to increase the effectiveness of standard COVID-19 treatment. The combination of Channa striata, Curcuma xanthorriza, and Moringa oleifera (Onoiwa Mx) administration can complement the treatment of COVID-19 as adjuvant therapy, especially for patients with mild and moderate pneumonia. Therefore, this study aims to assess the combined administration of Channa striata, Curcuma xanthoria, and Moringa Oliefera extracts as adjuvant therapy in standard COVID-19 treatment. The benefits and efficacy to improve the C reactive protein value, length of stay, and better scoring of the shortness scale were provided, and clinical observation was conducted with a prospective cohort study design. Furthermore, the subjects were patients with probable/positive PCR confirmation with moderate COVID-19 pneumonia after fulfilling the inclusion criteria. A total of 48 subjects were obtained and divided into control and treatment groups of 24 patients each. Three variables were analyzed bivariately, namely the LOS, MMRC, and CRP. The results showed that males (62.5%) had the most characteristic of the sample characteristics with an average age of 50.-54 years old, accompanied by symptoms of cough (91.7%), fever (77.1%), and

shortness of breath (75%). Furthermore, the most common comorbid disease of the two groups was hypertension (47.9%). In conclusion, each fever symptom in the treatment group had a median of 3, which means, 50% recovered after experiencing fever symptoms for 3 days. Meanwhile, the control group had a median of 4, which means, 50% recovered after experiencing fever symptoms for 4 days. Shortness of breath and cough each had a median of 4, which means 50% recovered after 4 days of symptoms. Therefore, the improvement in fever is consistent with that of CRP value, which increases the lymphocyte in the treatment group

Full article

Journal ID : **TMJ-05-08-2021-10545**
Total View : **483**

Title : The impact of medical and social rehabilitation on the adaptation of the elderly to modern social and legal processes

Abstract :
The article is devoted to the peculiarities of the process of medical and social rehabilitation of the elderly, which an increasing number of people of this age category requires. The paper examines the main causes and problems in the lives of the elderly, leading to their loss of physical and social activity, and subsequently to social isolation and misadaption of representatives of the specified age category. The article explores the relationship between the medical and social rehabilitation of the elderly and their participation in social and legal processes. The results of the most highly-publicized studies of scientists from different countries of the world concerning the problems of medical and social rehabilitation of the elderly and the importance of this process for society have been analyzed. Recommendations on the introduction of effective technologies of medical and social rehabilitation of the elderly, their impact on social and legal processes have been proposed.

Full article

Journal ID : **TMJ-05-08-2021-10544**
Total View : **420**

Title : Effect of Interval Tourniquet Use on MDA Levels and Liver Histopathological Damage in the Management of Long Bone Fractures

Abstract :
The use of arterial tourniquets as a tool for maintaining hemostasis in trauma has been widely used. The use of tourniquet serves to allow and accelerate operative procedures in musculoskeletal and vascular cases. In addition, torniquet is generally used to aid hemostasis in trauma cases. Providing torniquet perfusion time interval is known to reduce ischemic injury. However, the effect of reperfusion on the MDA level and histopathological damage of the liver has never been identified, thus requiring further research. This study determines the effect of the reperfusion interval in tourniquet use that causes reperfusion ischemic injury on the MDA level and histopathological damage of the liver in the management of long bone fracture. This study employed the true experimental method involving fractured Wistar rats. The Wistar rats were divided into 3 groups, group without reperfusion (P1), group with reperfusion of 10 minutes (P2), and group with reperfusion of 20 minutes. P1 ware treated with a tourniquet without being given a reperfusion interval for 3 hours. The rats in the P2 group were given a tourniquet with a reperfusion interval of 10 minutes after 2 hours. The rats in the P3 group were treated with a tourniquet with a reperfusion interval of 20 minutes after 2 hours of using the tourniquet, then the tourniquet was re-inflated for one hour. After 14 days, the rats were put down and analyzed for their MDA levels and their liver's histopathological damage. The statistical analysis used one-way ANOVA and Kruskal–Wallis with a significance level of $p < 0.05$. There was a difference in the reperfusion interval between P1, P2, and P3 groups regarding the MDA levels in the liver ($p < 0.05$). The reperfusion intervals of 10 and 20 minutes showed a higher reduction of the MDA level in the liver, compared to the group without reperfusion ($p < 0.05$). The reperfusion interval of 20 minutes showed a higher reduction of the MDA levels in the liver compared to P1 group ($p < 0.05$). There was a difference in the reperfusion interval between the group without reperfusion and the group with reperfusion regarding the liver's histopathological damage ($p < 0.05$). The use of reperfusion intervals of 10 and 20 minutes showed a higher reduction of cell ischemia and hepatic necrosis compared to the P1 group. The reperfusion interval of 20 minutes showed a higher reduction of the hepatic cell necrosis compared to the reperfusion interval of 10 minutes ($p < 0.05$). The reperfusion interval in

tourniquet use has an effect on reducing MDA levels and decreasing the number of ischemic and necrosis cells in the liver. There are differences in the duration of the reperfusion interval in the use of tourniquets in preventing ischemic injury.

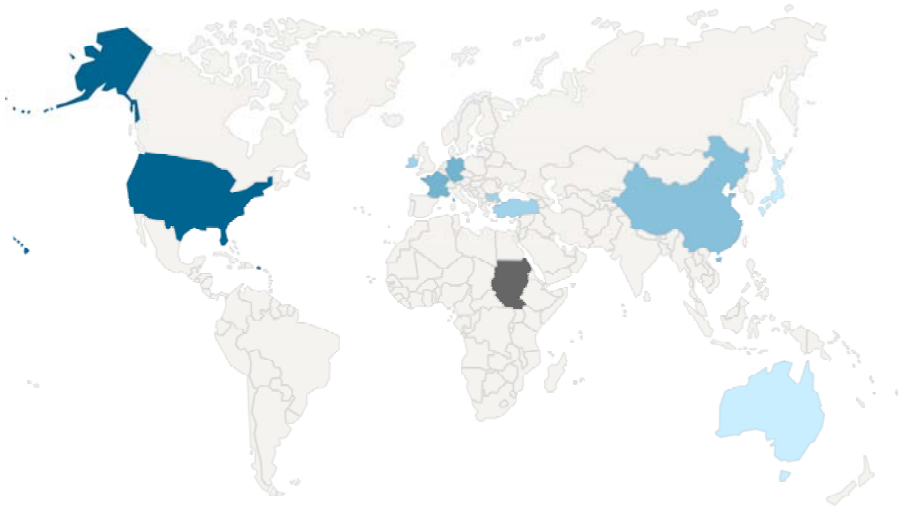
Full article

Journal ID : **TMJ-05-08-2021-10543**
Total View : **355**

Title : Periluminar Fluids in Abdominal Ultrasounds As A Predictor of Intestinal Viability in Pediatric Patients With Intussusception at Saiful Anwar Hospital Malang

Abstract :
Pediatric intussusception is the most common cause of intestinal obstruction in children between 4 and 10 months old. Ultrasound examination (USG) is the preferred examination in diagnosing intussusception. Periluminar fluid around the area of intussusception is associated with a failure of enema reduction and intestinal ischemia. Intestinal viability can determines whether to perform bowel resection at the time of intervention. The aim of this study is to test whether the periluminar fluid around the area of intussusception is associated with the presence of necrotic intestinal tissue. This study is a retrospective clinical observational analytic study, involving 30 pediatric patients with intussusception who had undergone surgery in the Pediatric Surgery section of the Dr. Saiful Anwar Malang Hospital, who previously had the results of an abdominal ultrasound examination evaluation with intussusception images. The parameters of intestinal viability in surgical findings are by looking at mucosal color, contractility, and vascularity of the intussusception area, which related to venous static and arterial pulsation. The data analysis used was correlation test with discriminative analysis. The spearman correlation test showed a significant relationship between the length, width and broad of the luminar fluid and viability, that is the higher of the length, width, and area of the luminar fluid, hence the lower viability. Based on the results of the unpaired t-test, the cut off point value for the length of the luminar fluid is 2.187, the width of the luminar fluid is 1.931, and the area of the luminar fluid is 13.259. Ultrasound periluminar fluid images can be considered as a predictor of intestinal viability in pediatric intussusception.

Full article



//

Teikyo Medical Journal

COUNTRY	SUBJECT AREA AND CATEGORY	PUBLISHER	H-INDEX
Japan Universities and research institutions in Japan	Medicine Medicine (miscellaneous)	Teikyo University School of Medicine	2

PUBLICATION TYPE	ISSN	COVERAGE	INFORMATION
Journals	03875547	1990-2019	Homepage How to publish in this journal sakaijuro45@gmail.com

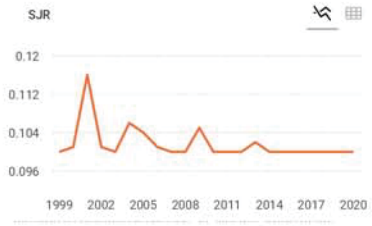
SCOPE

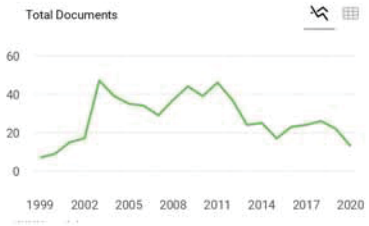
Teikyo Medical Journal (ISSN: 03875547) is a peer-reviewed journal. The journal seeks to publish original research articles that are hypothetical and theoretical in its nature and that provide exploratory insights in the following fields but not limited to: Anatomy Physiology Biochemistry Pharmacology Pathology Forensic medicine Microbiology Community Medicine Otorhinolaryngology Internal Medicine General Surgery Anatomy Physiology Biochemistry Pharmacology Pathology Forensic medicine Microbiology Community Medicine Otorhinolaryngology Internal Medicine General Surgery Obstetrics and Gynecology Radiology Anatomy Physiology Biochemistry Pharmacology Pathology Forensic medicine Microbiology Community Medicine Otorhinolaryngology Internal Medicine General Surgery Obstetrics and Gynecology Radiology.

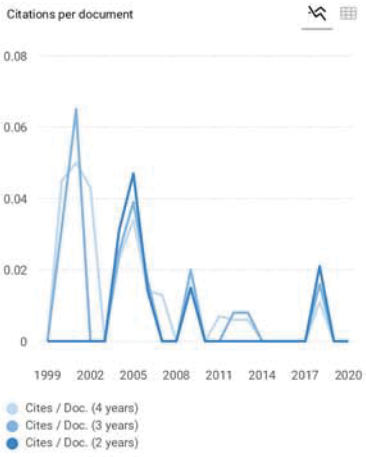
FIND SIMILAR JOURNALS

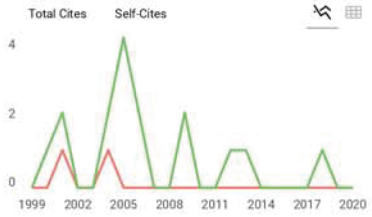
options

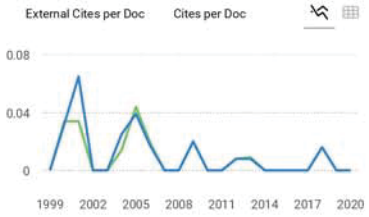
1	2	3	4	5
Expert Opinion on Biological Therapy	**Expert Review of Precision Medicine and Drug**	**Expert Opinion on Investigational Drugs**	**Journal of Thoracic Disease**	**Annual Review of Medicine**
GBR	GBR	GBR	HKG	USA
43% similarity	41% similarity	40% similarity	40% similarity	39% similarity

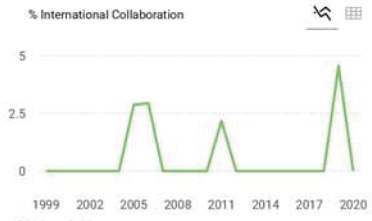


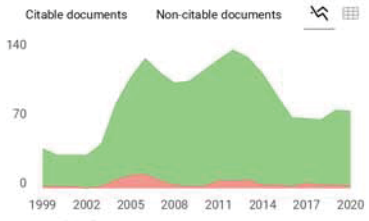


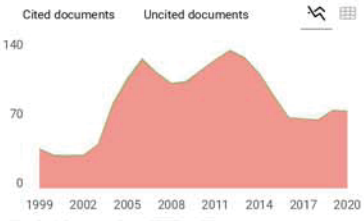












← Show this widget in your own website

Just copy the code below and paste within your html code:

<a href="https://www.scim

Metrics based on Scopus® data as of April 2021

Leave a comment

Name

Email
(will not be published)

I'm not a robot
reCAPTCHA
Privacy - Terms

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

Developed by: SCImago

Powered by: Scopus

Follow us on @ScimagoJR

EST MODUS IN REBUS

Source details

Teikyo Medical Journal

Scopus coverage years: from 1990 to Present

Publisher: Teikyo Daigaku

ISSN: 0387-5547

Subject area: Medicine: General Medicine

Source type: Journal

View all documents > Set document alert Save to source list

CiteScore 2020
0.0

SJR 2020
0.100

SNIP 2020
0.000

CiteScore CiteScore rank & trend Scopus content coverage

Improved CiteScore methodology

CiteScore 2020 counts the citations received in 2017-2020 to articles, reviews, conference papers, book chapters and data papers published in 2017-2020, and divides this by the number of publications published in 2017-2020. Learn more >

CiteScore 2020

$$0.0 = \frac{1 \text{ Citations } 2017 - 2020}{81 \text{ Documents } 2017 - 2020}$$

Calculated on 05 May, 2021

CiteScoreTracker 2021

$$0.0 = \frac{3 \text{ Citations to date}}{81 \text{ Documents to date}}$$

Last updated on 04 August, 2021 • Updated monthly

CiteScore rank 2020

Category	Rank	Percentile
Medicine └ General Medicine	#782/793	1st

View CiteScore methodology > CiteScore FAQ > Add CiteScore to your site

Teikyo-1

by Rivan Virlando Suryadinata

ISSN: 03875547
Volume 44, Issue 04, August, 2021

Effect of Knowledge and Attitude toward Sun Exposure Related Vitamin D to Lung Function

Rivan Virlando Suryadinata[1*], Sawitri Boengas[1], Amelia Lorensia[2]

Faculty of Medicine, Universitas Surabaya, Jl.Raya Kalirungkut, Surabaya, Indonesia[1]
Faculty of Pharmacy, Universitas Surabaya, Jl.Raya Kalirungkut, Surabaya, Indonesia[2]

Corresponding Author: 1*

Keywords:
Attitude, FEV1/FVC, knowledge, sun exposure, vitamin D

ABSTRACT

Indonesia is a country with a tropical climate with sun exposure throughout the season, because sunlight is the largest source of vitamin D. The risk of vitamin D deficiency can lead to respiratory problems. With good self-management, of course, adequate knowledge and attitudes are needed in overcoming various individual health problems. The purpose was to influence knowledge and attitudes towards sun exposure in meeting the need for vitamin D to improve lung function in healthy respondents without chronic respiratory disorders. The research will be conducted using a cross sectional design, in May-August 2019. The variables were knowledge and attitudes towards sun exposure related to the risk of vitamin D deficiency and lung function by forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC). Respondents used in this study were 168 respondents. Most of the respondents had good level of knowledge (97 of 168), and most of the respondents had good level of attitude (115 of 168). There was relationship between the level of knowledge (p=0.000) and attitude (p=0.000) toward sun exposure levels related to vitamin D and lung function. And there was relationship between the level of knowledge to attitude on sun exposure levels related to vitamin D (p=0.000). Therefore, knowledge and attitudes on sun exposure related to vitamin D were important concerns to maintain healthy lung function.

1. INTRODUCTION

Indonesia is in a tropical climate region with sun exposure throughout the season. Sunlight can produce ultraviolet rays that cannot be seen by the eyes directly, but have benefits for the body [1], [2]. The effects that can be felt from sun exposure can be seen in the short term and long term. Effects that can be caused in the short term such as erythema, photosensitivity and pigmentation are acute. The long-term effects include skin cancer and premature aging [3]. Previous research showed that vitamin D levels were less than 50 nmol/L in participants who still had Indian, Malay and Chinese ancestry [4]. Research in Indonesia shows that many people experience vitamin D deficiency from various backgrounds and ages [2], [5- 8]. Sun exposure is the largest source of vitamin D which is very beneficial for the body apart from food sources

and supplements [9]. Vitamin D consists of two types, namely D2 or ergocarsiferol and vitamin D3 or cholecalciferol. Vitamin D2 or ergocarsiferol can be obtained from supplements and food [10]. Vitamin D3 or cholecalciferol is produced from the synthesis of 7-dehydrocholesterol obtained from sunlight and can be obtained by consuming milk, supplements, yogurt, fish oil, cereals and margarine. Vitamin D which is produced from sunlight, namely UVB rays, has benefits for bone formation and reduces the risk of diseases including arthritis, skin cancer and autoimmune diseases [11], [12].

Although Indonesia is a country that has a great opportunity to be exposed to sunlight, it has a low risk of vitamin D status. Low levels of vitamin D can be influenced by skin color, age, and gender [13]. The risk of vitamin D deficiency can lead to respiratory problems. There's a relationship between vitamin D deficiency related to respiratory disorders such as chronic obstructive pulmonary disease(COPD), tuberculosis and asthma. Respiratory disorders that occur in a person are caused by the immune system in the body inhibiting the production of cytokines, thereby reducing inflammation [14- 16]. Vitamin D which is present in one of the respiratory systems, namely the lungs, will have the effect of changing T cell activity, increasing the secretion of antimicrobial katelecidin peptide, producing chemokines and inhibiting dendritic cell activity. This effect is used to fight infections that can cause lung diseases. If the level of vitamin D in smokers is low, the damage to lung function will be faster [15- 17].

Respiratory disorders that occur greatly affect the quality of life of every affected community [18]. So to improve the quality of life of the community in the health sector and in an effort to prevent the incidence of illness, the government through the health department plans a healthy community movement by making 7 main agendas such as maintaining environmental cleanliness, consuming fruit and vegetables, not consuming alcohol, not smoking, doing physical activity, check their health regularly and maintain the cleanliness of the latrines [19]. This program will never be implemented properly without self-management from within each individual such as controlling thoughts, emotions, behavior and being able to motivate oneself to achieve goals in improving one's own health [20]. With good self-management, of course, adequate knowledge and attitudes are needed in overcoming various individual health problems [21]. The of individuals have less knowledge and attitudes towards health problems. The relationship between knowledge and attitudes related to decreased lung function is very low due to several factors such as education level and living environment [22]. Therefore, this study aimed to influence knowledge and attitudes towards sun exposure in meeting the need for vitamin D to improve lung function in healthy respondents without chronic respiratory disorders.

2. METHODS

The research will be conducted using a cross sectional design, by giving a questionnaire to each respondent to measure differences in knowledge and attitudes related to sun exposure in May until August 2019. The variables of this study were the level of knowledge and attitudes towards sun exposure related to the risk of vitamin D deficiency and lung function by forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC). This research had received ethical test No.004-OL/KE/V/2019 from Universitas Surabaya Lung function referred to in this study is how well the ability to move air in and out of the lungs and how well oxygen enters the body. Lung function can be measured through spirometry measurements by looking at the FEV1/FVC value, where an FEV1 value of <70% can be said to have impaired lung function. The value of FEV1/FVC is good if the results show ≥0.7 [23], [24]. The requirements that must be considered by each respondent before pulmonary function tests are carried out are as follows: No smoking for an hour before test; Didn't consume alcohol for the previous 4 hours before test; Not doing sports activities for the previous 30 minutes before test; Didn't eat for 2 hours before test; Didn't wear tight clothes; and No medication was taken before [25]. Measurement of lung function using a handheld spirometer where body

mass index (BMI) data in the form of weight and height and respondent data in the form of gender, age, smoker or not are entered into the spirometer. Then the respondent was asked to stand or sit up straight, then the respondent is asked to inhale as deeply as possible through the mouth while closing the nose, then the tube contained in the spirometer is inserted into the mouth, making sure the lips tightly cover the tube wall and the tongue does not cover the tube opening, then breathe out. Exhale as hard and fast as possible in one second until there was no air left in the lungs. Examination with a spirometer can be done 3 times or more to get more accurate results. The results of the spirometer measurement from the respondent will determine whether the respondent has respiratory problems or does not experience respiratory problems based on the FEV1 value. FEV1 value <70% already indicates respiratory problems. So if the value of FEV1 <70%, then it is categorized in the group of respiratory disorders and FEV1 70% is categorized in the group that does not experience respiratory disorders [24], [26], [27].

The knowledge data collection was carried out using a questionnaire that has been used in previous studies [8], [29- 31]. The questions in the questionnaire consist of 11 questions that were structured in the form of open-ended questions and closed-ended questions. The type of data used in this variable used ordinal variable. The assessment of the level of knowledge of the respondents was carried out by calculating the total score of correct answers to each question, each correct answer will be given a score of 1, so that the maximum total correct answer of the respondent is a score of 11. In this study the level of knowledge was categorized into 2, namely the level of knowledge was high if the number was correct 6 items and low level of knowledge if the number of correct answers <6 items.

The attitude data collection was carried out using a questionnaire that has been used in previous studies [8], [29- 31]. The questions in the questionnaire consist of 9 questions that were used to determine attitudes towards sun exposure. The types of data used in this study were ordinal and nominal variables. In this study, the assessment of attitudes related to sun exposure was divided into 2 categories consisting of good attitudes and bad attitudes. Each question asked will be given a score of 2 if the research subject had an attitude that tends to be at risk of vitamin D deficiency. This questionnaire can produce a maximum score of 18 points, if the respondent's answer produces 9 points then it can be categorized as a good attitude, but if >9 points then respondent's attitude was categorized as bad.

The research subjects were young people (≥18 years) as students in the Rungkut District, Surabaya. Sampling technique was done by purposive and consecutive sampling method. The sample size formula that will be used in this study was Lemeshow because it does not know the previous sample population. So the minimum respondents who will be used in the study are 62 respondents. In this study, the questionnaire used was a previous research questionnaire which had been validated twice. The first validation used was content validation, where the questionnaire that has been obtained from the journal was translated into Indonesian first. The second validation was construct validation, where the questionnaire will be distributed to 30 students at the University of Surabaya after which data processing will be carried out using SPSS version 24 software. Reliability was the stability of the results to the extent that a questionnaire that has been measured repeatedly with any method will produce the same results. Reliability was carried out on 20-30 subjects and not included in the sample, then it would be analyzed using the Cronbach's alpha method in the SPSS software.

Data analysis to examine the relationship of knowledge and attitudes on sun exposure related to vitamin D on lung function (ratio FEV1/FVC) using chi-square test. Then the test was also used to analyze the relationship between knowledge and attitudes on sun exposure levels related to vitamin D.

3. RESULTS

3.1 Validity and reliability test results

In testing the validity and reliability of the questionnaire regarding knowledge of sun exposure related to vitamin D, random sampling was carried out on smokers and non-smokers, then 30 respondents were taken. Validity and reliability tests were carried out using SPSS software. The results of the validity test regarding knowledge of sun exposure related to vitamin D, obtained from each question item regarding knowledge of sun exposure related to sun exposure are valid (0.707) because the value of rcount>0.361. So the results of the reliability test carried out at the level of knowledge of sun exposure related to vitamin D were declared reliable.

The results of the validity test regarding attitudes towards sun exposure related to vitamin D obtained from each question item regarding attitudes towards sun exposure related to sun exposure were declared valid (0.620) because the r value was >0.361. So the results of the reliability test carried out on the level of attitude towards sun exposure related to vitamin D were declared reliable.

3.2 Characteristics of Respondents

Respondents used in this study were 168 respondents. The average age of the respondents was 21.60 years. Most of the respondents had normal weight (137 of 168). Most of the respondents had a ratio value of FEV1/FVC <0.7 (155 of 168) which indicated a decrease in lung function (Table 1).

Table 1: Frequency Distribution of Respondents Characteristics

Characteristics		Frequency (n=168)	Percentage (%)
Age (years)	18	10	5.95
	19	17	10.12
	20	20	11.90
	21	31	18.45
	22	32	19.05
	23	32	19.05
	24	15	8.93
	25	11	6.55
BMI (kg/m²)	Thin (≤18,5)	20	11.90
	Normal (18,5-<25)	137	81.55
	Overweight (25,0-<27)	11	6.55
FEV1/FVC value	<0.7	72	42.86
	≥0.7	96	57.14

3.3 Knowledge on sun exposure related to vitamin D

The profile of answers regarding knowledge on sun exposure related to vitamin D can be seen in Table 2. The knowledge classification was divided into good (≥9 points) and bad (<9 points). Most of respondents had good level of knowledge (97 of 168). The results of the different test with chi-square test showed there was a relationship between the level of knowledge on sun exposure levels related to vitamin D and lung function (ratio FEV1/FVC) (P value (0.000)<0.05) (Table 3).

Table 2: Profile of Knowledge Level Answers toward sun exposure related to vitamin D

No		Question	Frequency (n=168)	Percentage (%)
1.	Information about vitamin D	Ever heard	124	73.81
		Never heard	44	26.19
	What is known about vitamin D (**)	Vitamins from the sun	34	88.23
		Vitamins for bone growth	26	15.48
		Vitamins used for immunity	78	46.43

ISSN: 03875547
Volume 44, Issue 04, August, 2021

		Don't know	30	17.86
2.	Source of information about vitamin D (*)	Pharmacists/Nurses/Doctors	12	7.14
		Family	9	5.36
		Book	21	12.50
		School	31	18.45
		Internet	49	29.17
		Friend	32	19.05
		Don't know	14	8.33
3.	Greatest source of vitamin D	Vitamins or Supplements	35	20.83
		Vegetable	30	17.86
		Sun	24	14.29
		Meat	6	3.57
		Egg	33	19.64
		Fish	22	13.09
		Don't know	18	10.71
4.	Benefits of vitamin D	Bone growth and maintenance	91	54.17
		Regulating calcium and phosphorus levels in body	30	17.86
		Immune	33	19.64
		Don't know	14	8.33
5.	Due to vitamin D deficiency (*)	Cancer	66	39.29
		Obesity	11	6.55
		Cholesterol increase	12	7.14
		Bone disease	60	35.71
		High blood pressure	24	14.29
		Don't know	8	4.76
6.	Causes of the body lack of vitamin D (*)	Using an umbrella during the day	77	45.83
		Sunbathing on the beach	7	4.17
		Doing regular physical activity	22	13.10
		Using closed clothes	75	44.64
		Using sunscreen	56	33.33
		Don't know	12	7.14
7.	The sun can help produce vitamin D	Agree	66	39.29
		Don't agree	58	34.52
		Don't know	44	26.19
	Reason	Can be used for bone health	82	48.81
		The sun is the synthesis of vitamin D in body	86	51.19
8.	Sunlight is harmful to the skin	Yes	86	51.19
		No	82	48.81
	The reason (**)	Too hot	63	37.50
		Cause skin cancer if it's too long	29	17.26
		For fear of black	65	38.69
		Don't know	11	6.55
9.	The best time for the body to be exposed to direct sunlight is at... until….	06.00–09.00 a.m	70	41.67
		07.00–09.00 a.m	40	23.81
		10.00 a.m–02.00 p.m	33	19.64
		Afternoon	25	14.88
10.	A good time for the body to get vitamin D from sun exposure	5–15 minutes	51	30.36
		15–30 minutes	60	35.71
		30–60 minutes	39	23.21
		>1 hour	18	10.71
11.	A good amount of SPF for the body	<15	58	34.52
		≥15	73	43.45
		Don't know	37	22.02

*) Respondent's answer can be more than one

**) Open Question

Table 3: Cross-tabulation of Knowledge toward sun exposure levels related to vitamin D

Knowledge level on sun exposure related to vitamin D		**Lung Function**		**Frequency (n=168)**	Chi-Square Test
Number of Questions Correct	**Category e**	**<0.7**	**≥ 0.7**		
≥9 points	Good	12	85	97	0.000

<9 points	Bad	60	11	71
		72	96	**168**

3.4 Attitude on sun exposure related to vitamin D

The profile of answers regarding attitude on sun exposure related to vitamin D can be seen in Table 4. The atitude classification was divided into good (≥7 points) and bad (<7 points). Most of the respondents had good level of attitude (115 of 168). The results of the different test with the chi-square test showed that there was a relationship between the level of attitude on sun exposure levels related to vitamin D and lung function (ratio FEV1/FVC) (P value (0.000) <0.05) (Table 5).

Table 4: Profile of Answer Level Attitude toward sun exposure related to vitamin D

No		Question	Frequency (n=168)	Percentage (%)
1.	Frequent trips or walks in direct sunlight	Yes	168	100
2.	Length per day you get sunlight (minutes)	5	26	15.48
		5–15	47	27.98
		20–30	63	37.50
		> 30	32	19.05
3.	Avoid direct sun exposure	Yes	111	66.07
		No	57	33.93
	If yes, why (**)	Avoid the heat or the sun	41	24.40
		Afraid of black	47	27.98
		Don't know	23	13.69
	If not the reason (**)	Sunlight is good for skin and bones	37	22.02
		Lots of outdoor activities	11	6.55
		Don't know	9	5.36
4.	Use skin protection equipment to avoid sun exposure	Yes	156	92.86
		No	12	7.14
	What type of protective equipment is used (**)	Jacket	82	48.81
		Sunblock	14	8.33
		Jacket and sunscreen	8	4.76
		Hat	52	30.95
5.	The reason you use protective equipment	Avoid black skin	90	53.57
		Avoid heat	72	42.86
		Because men are not afraid of heat	6	3.57
6.	Taking vitamin D supplements	Yes	0	0
		No	168	100
7.	The purpose of taking vitamin D supplements	Sufficient vitamin D needs	47	27.98
		Bone growth and maintenance	88	52.38
		Don't know	33	19.64
8.	Opinions about the need for vitamin D in the body	It's enough	89	52.98
		Not enough	79	47.02
	If it is sufficient, the reason (**)	Frequent exposure to the sun	46	27.38
		Often eat vegetables and drink milk	22	13.10
		Feeling never sick	13	7.74
		Give no reason	8	4.76
	If not sufficient, the reason (**)	Never feel pain	24	14.29
		Avoid the sun	38	22.62
		Give no reason	17	10.12
9.	Have an interest in knowing more about vitamin D	Yes	116	69.05
		No	52	30.95
	If yes, the reason	Increase knowledge and insight	66	39.29
		Vitamin D is important for the body	25	14.88
		More want to know about vitamin D	25	14.88

*) Respondent's answer can be more than one

**) Open Question

ISSN: 03875547
Volume 44, Issue 04, August, 2021

Table 5: Cross-tabulation of Attitude toward sun exposure levels related to vitamin D

Attitude level on sun exposure related to vitamin D		Lung Function		Frequency (n=168)	Chi-Square Test
Number of Questions Correct	Category Level of Attitude	<0.7	≥0.7		
≥ 9 points	Good	25	90	115	0.000
< 9 points	Bad	47	6	53	
		72	96	**168**	

Relationship Knowledge and Attitude on sun exposure related to vitamin D

The results of the different test with the chi-square test showed that there was a relationship between the level of knowledge to attitude on sun exposure levels related to vitamin D (P value (0.000)<0.05) (Table 6).

Table 6: Cross-tabulation of Knowledge and Attitude toward sun exposure related to vitamin D

Attitude level on sun exposure related to vitamin D	Knowledge level on sun exposure related to vitamin D		Frequency (n=168)	Chi-Square Test
	Good (≥9 points)	Bad (<9 points)		
Good (≥7 points)	80	17	97	0.000
Bad (<7 points)	35	36	71	
	115	53	**168**	

4. DISCUSSION

Age was the main factor that affects lung function disorders. Age was related to the aging process where the increasing age of a person, the greater the possibility of a decrease in lung function capacity. There was significant relationship between age and lung function capacity. In addition, with increasing age, the perception and mindset will develop, so that the knowledge gained was getting better [32- 34]. The measurement of the spirometer value carried out in FEV1/FVC value. The limitation of this study was that it did not measure blood levels of vitamin D, because there were several factors other than knowledge and attitudes that can affect lung function. Factors that can affect lung function include:

1. Age. Age appears to be a reinforcing factor. Based on the theory that age can affect knowledge, the older one gets, the easier it is to digest the information obtained. The results obtained in this study differ from the theory, where age does not affect knowledge of sun exposure.
2. Genetics, the influence of genetic factors on pulmonary function, as demonstrated mostly by FEV1 and FVC, has been investigated in several studies. FVC was taken as lung size and FEV1 was taken as airflow rate [35]. The most trusted genetic risk factor at present is a deficiency of 1-antitrypsin which is a major inhibitor of circulating serine proteases. 1-antitrypsin is a serum protein produced by the liver and normally found in the lungs to inhibit the destructive action of the neutrophil elastase enzyme on lung tissue. A decrease in the level of 1-antitrypsin to less than 35% of the normal value (150-350 mg/dL) causes reduced protection of lung parenchyma tissue, destruction of the adjacent alveolar walls, and finally causes a decrease and damage to the lung. The most common genetic variants of 1-antitrypsin are M, S and Z. The M allele's normal while the S and Z alleles are associated with defisiensi1-antitrypsin deficiency. Moderate 1-antitrypsin deficiency is most often caused by the MS and MZ genotypes [36], [37].
3. Smoking, cigarette smoke can cause local damage to the respiratory tract, such as loss of ciliary function. Cilia function as a deterrent to foreign objects, so that foreign objects and other pollutants will not easily enter the lungs. This decrease in ciliary function increases the risk of lung function disorders, because dust and pollutants can easily enter the lungs. This theory clearly states that cigarette smoke can cause a decrease in lung function, so that pulmonary function disorders are not only experienced by active smokers and former smokers, but can also be experienced by passive smokers [38], [39].

Factors that influence the response profile of the level of knowledge and attitudes towards sun exposure related to vitamin D in respondents:

1. Respondents who answered that they'd heard about vitamin D were 124 of 168. Vitamin D was

used for bone growth and respondents who knew that vitamin D was for immunity were 10.26%. The mechanism of vitamin D in bone formation and bone maintenance is by activating calcitriol or 1,25-dihydroxycholecalciferol from 25(OH)D3 to be 10 times more active than vitamin D3 in kidney. This calcitriol will increase the absorption of calcium and phosphorus in bones [12], [40]. At the age of respondent, more information about vitamin D was obtained from the internet (49 of 168) and friends (32 of 168).

2. Most of respondents answered that the largest source of vitamin D came from vitamin D supplements (35 of 168). The answer wasn't correct because the largest source of vitamin D from sun exposure besides vitamins and supplements. Vitamin D2 or ergocarsiferol can be obtained from supplements and food. Meanwhile, vitamin D3 was produced from the synthesis of 7-dehydrocholesterol which was obtained from sunlight and can be obtained by consuming milk, supplements, yogurt, fish oil, cereals and margarine [12], [41].

3. Respondents' answers said that the benefits of vitamin D are for bone health (91 of 168). Benefits of vitamin D is used for growth and maintenance of bones, vitamin D is used to regulate calcium and phosphorus levels in the body, and vitamin D is used for immunity. Vitamin D which is produced from sunlight, namely UVB rays, has benefits for bone formation and reduces the risk of diseases including arthritis, skin cancer and autoimmune diseases [12]. The mechanism of vitamin D in bone formation and bone maintenance is by activating calcitriol or 1,25-dihydroxycholecalciferol from 25(OH)D3 to be 10 times more active than vitamin D3 in the kidney. This calcitriol will increase the absorption of calcium and phosphorus in bones [42].

4. The result of vitamin D deficiency's the occurrence of rickets in children which can be characterized by early symptoms such as osteomalacia, swollen bones forming X and O. There's a close relationship between vitamin D deficiency and decreased lung function. The mechanism of vitamin D in bone formation and bone maintenance is by activating calcitriol or 1,25-dihydroxycholecalciferol from 25(OH)D3 to be 10 times more active than vitamin D3 in kidney. This calcitriol will increase the absorption of calcium and phosphorus in bones [42].

5. Any protective device that interferes with the penetration of UVB radiation can affect the synthesis of vitamin D3 [43]. As sunscreen, general window glass at home or car and clothing, all of them effectively block UVB radiation even in summer, people who work indoors, wear extensive clothing, regularly use sunscreen, dark skin, obesity, aged Continued or consciously avoiding the sun will risk vitamin D deficiency [44], [45]. Sun exposure can be used to help body produce vitamin D in the amount it needs each day. However, for fear of getting skin cancer, most people avoid sun exposure. To prevent vitamin D deficiency, one should spend 15 to 20 minutes daily in the sun with 40% of the skin surface exposed [46].

6. Most respondents said that the best time to be exposed to the sun is 06.00-09.00 a.m (70 of 168) with a duration of 15-30 minutes (60 of 168). Exposure to direct sunlight can be harmful and not harmful, where exposure to sunlight can harm the skin if exposed for too long, triggering skin cancer and exposure to sunlight that does not harm the skin can be used to meet the needs of vitamin D in the body [47]. A good time for the skin to get vitamin D from direct sunlight is 15–30 minutes, because if the body is exposed to excessive sunlight it can trigger skin cancer [48], [49]. Exposure to abundant sunlight with high intensity can cause skin hyperpigmentation so that the skin becomes dull and scaly and can even increase the risk of skin cancer. These effects're mainly caused by UV A and B rays. In small amounts, UV-B radiation's beneficial for the synthesis of vitamin D in the body, but excessive exposure to these rays can cause skin redness/burning and harmful effects of synthesis. free radicals that trigger erythema and cataracts [48,49,50].

7. If the skin's exposed to excessive sunlight, there will be high cumulative ultraviolet (UV) radiation that can damage skin cells, affect the normal growth and appearance of the skin and cause acute skin damage, including aging and burning. In addition, more complicated chronic problems can occur with long-

term exposure, such as skin aging and skin cancer [48- 50]. UV radiation is also responsible for significant eye damage, particularly cataract formation. Sun Protection Factor (SPF) which is good for the body is 15. With an SPF of 15, it's said to be able to absorb 99% of UVB radiation, so that it can reduce the synthesis of vitamin D3 in the skin [51].

There's a risk of vitamin D deficiency if a person intentionally avoids sun exposure, because daily sun exposure helps the human body to produce vitamin D in the required amount. The results showed there're still many people who were active outside the room compared to indoors [52], [53].

5. CONCLUSION

There was a relationship between the level of knowledge and attitude toward sun exposure levels related to vitamin D and lung function. And there was a relationship between the level of knowledge to attitude on sun exposure levels related to vitamin D.

6. ACKNOWLEDGMENTS

This research was funded by the Institute of Research and Community Service of the Universitas Surabaya.

7. CONFLICT OF INTEREST

The authors have no conflicts of interest regarding this investigation.

8. REFERENCES

[1] Nimitphong H, Holick MF. Vitamin D status and sun exposure in southeast Asia. Dermatoendocrinol.2013;5(1):34–7.

[2] Oktaria V, Graham SM, Triasih R, Soenarto Y, Bines JE, Ponsonby AL, et al. The prevalence and determinants of vitamin D deficiency in Indonesian infants at birth and six months of age. PLoS ONE.2020;15(10): e0239603.

[3] Hoel DG, Berwick M, de Gruijl FR, Holick MF. The risks and benefits of sun exposure 2016. Dermatoendocrinol.2016;8(1):e1248325.

[4] Divakar U, Sathish T, Soljak M, et al. Prevalence of Vitamin D Deficiency and Its Associated Work- Related Factors among Indoor Workers in a Multi-Ethnic Southeast Asian Country. Int J Environ Res Public Health.2019;17(164):1–10.

[5] Aji AS, Erwinda E, Yusrawati Y, Malik SG, Lipoeto NI. Vitamin D deficiency status and its related risk factors during early pregnancy: a cross-sectional study of pregnant Minangkabau women, Indonesia. BMC Pregnancy Childbirth.2019;19(183):1–10.

[6] Oktaria V, Triasih R, Graham SM, Bines JE, Soenarto Y, Clarke MW, Lauda M, Danchin M. Vitamin D deficiency and severity of pneumonia in Indonesian children. PLoS One.2021;16(7):e0254488.

[7] Pulungan A, Soesanti F, Tridjaja B, Batubara J. Vitamin D insufficiency and its contributing factors in primary school-aged children in Indonesia, a sun-rich country. Ann Pediatr Endocrinol Metab.2021;26(2):92–8.

[8] Lorensia A, Suryadinata RV, Amir GA. Relation Between Vitamin D Level and Knowledge and Attitude Towards Sunlight Exposure Among Asthma Outpatients in Surabaya. Global Medical & Health

Communication.2019;7(3):162–9.

[9] Trummer C, Pandis M, Verheyen N, et al. Beneficial Effects of UV-Radiation: Vitamin D and beyond. Int J Environ Res Public Health.2016;13(10):1028.

[10] Shieh A, Chun RF, Ma C, et al. Effects of High-Dose Vitamin D2 Versus D3 on Total and Free 25-Hydroxyvitamin D and Markers of Calcium Balance. J Clin Endocrinol Metab.2016;101(8):3070–8.

[11] Polzonetti V, Pucciarelli S, Vincenzetti S, Polidori P. Dietary Intake of Vitamin D from Dairy Products Reduces the Risk of Osteoporosis. Nutrients.2020;12(6):1743.

[12] Bikle DD. Extraskeletal actions of vitamin D. Ann N Y Acad Sci.2016;1376(1):29–52.

[13] Al-Horani H, Abu Dayyih W, Mallah E, et al. Nationality, Gender, Age, and Body Mass Index Influences on Vitamin D Concentration among Elderly Patients and Young Iraqi and Jordanian in Jordan. Biochem Res Int.2016; 2016:8920503.

[14] Gatera VA, Abdulah R, Musfiroh I, Judistiani RTD, Setiabudiawan B. Updates on the Status of Vitamin D as a Risk Factor for Respiratory Distress Syndrome. Adv Pharmacol Sci.2018; 2018:8494816.

[15] Hejazi ME, Modarresi-Ghazani F, Entezari-Maleki T. A review of Vitamin D effects on common respiratory diseases: Asthma, chronic obstructive pulmonary disease, and tuberculosis. J Res Pharm Pract.2016;5(1):7–15.

[16] Kokturk N, Baha A, Oh YM, Young Ju J, Jones PW. Vitamin D deficiency: What does it mean for chronic obstructive pulmonary disease (COPD)? a compherensive review for pulmonologists. Clin Respir J.2018;12(2):382–97.

[17] Bishop E, Ismailova A, Dimeloe SK, Hewison M, White JH. Vitamin D and immune regulation: antibacterial, antiviral, anti-inflammatory. JBMR Plus.2020;5(1):e10405

[18] Miravitlles, M., Ribera, A. Understanding the impact of symptoms on the burden of COPD. Respir Res.2017;18(67):1–11.

[19] Werdhani RA. Medical problem in Asia pacific and ways to solve it: The roles of primary care/family physician (Indonesia Xperience). J Family Med Prim Care.2019;8(5):1523–7.

[20] Berkman ET. The Neuroscience of Goals and Behavior Change. Consult Psychol J.2018;70(1):28–44.

[21] Lorensia A, Setiawan B, Maranatha D, Yudiarso A. Effectiveness of Education Based Information-Motivation-Behavioral Skill (IMB) Model of Improving Knowledge, Motivation, and Performance Demonstration Metered-Dose Inhaler (MDI) to Community Pharmacists in Surabaya. International Journal of Pharmaceutical and Clinical Research.2017;9(7):485–95.

[22] Kumar S, Preetha G. Health promotion: an effective tool for global health. Indian J Community Med.2012;37(1):5–12.

[23] Haynes JM. Basic spirometry testing and interpretation for the primary care provider. Can J Respir Ther.2018;54(4):92–8.

[24] Sim YS, Lee JH, Lee WY, et al. Spirometry and Bronchodilator Test. Tuberc Respir Dis (Seoul).2017;80(2):105–12.

[25] Redlich CA, Tarlo SM, Hankinson JL, Townsend MC, Eschenbacher WL, Von Essen SG, Sigsgaard T, Weissman DN; American Thoracic Society Committee on Spirometry in the Occupational Setting. Official American Thoracic Society technical standards: spirometry in the occupational setting. Am J Respir Crit Care Med.2014;189(8):983–93.

[26] Lamb K, Theodore D, Bhutta BS. Spirometry. [Updated 2021 Feb 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK560526/

[27] Tollånes MC, Sjaastad GE, Aarli BB, Sandberg S. Spirometry in chronic obstructive pulmonary disease in Norwegian general practice. BMC Fam Pract.2020;21(1):235.

[28] GOLD (Global Initiative for Chronic Obstructive Lung Disease. 2021 Global Strategy For Prevention, Diagnosis And Management Of Copd. https://goldcopd.org/2021-gold-reports/

[29] Arora H, Dixit V, Srivastava N. Evaluation of knowledge, practices of vitamin D and attitude toward sunlight among Indian students. Asian J Pharm Clin Res.2016;9(1):308–13.

[30] Al Bathi BA, Al Zayed KE, Al Qenai M, Makboul G, El-Shazly MK. Knowledge, attitude and practice of patients attending primary care centers toward vitamin D in Kuwait. Alexandria J Med.2012;48(3):277–82.

[31] Zhou M, Zhuang W, Yuan Y, Li Z, Cai Y. Investigation on vitamin D knowledge, attitude and practice of university students in Nanjing, China. Public Health Nutr.2016;19(1):78–82.

[32] Rojas M, Mora AL, Kapetanaki M, Weathington N, Gladwin M, Eickelberg O. Aging and Lung Disease. Clinical Impact and Cellular and Molecular Pathways. Ann Am Thorac Soc.2015;12(12):S222–7.

[33] Thomas ET, Guppy M, Straus SE, et al. Rate of normal lung function decline in ageing adults: a systematic review of prospective cohort studies BMJ Open.2019;9:e028150.

[34] Sharma G, Goodwin J. Effect of aging on respiratory system physiology and immunology. Clin Interv Aging.2006;1(3):253–60.

[35] Peng, Y., Zhong, GC., Wang, L. et al. Chronic obstructive pulmonary disease, lung function and risk of type 2 diabetes: a systematic review and meta-analysis of cohort studies. BMC Pulm Med.2020;20(137):1–12.

[36] Brantly, M., Campos, M., Davis, A.M. et al. Detection of alpha-1 antitrypsin deficiency: the past, present and future. Orphanet J Rare Dis.2020;15(96):1–10.

[37] Foreman MG, Wilson C, DeMeo DL, Hersh CP, Beaty TH, Cho MH, Ziniti J, Curran-Everett D, Criner G, Hokanson JE, Brantly M, Rouhani FN, Sandhaus RA, Crapo JD, Silverman EK; Genetic Epidemiology of COPD (COPDGene) Investigators *. Alpha-1 Antitrypsin PiMZ Genotype Is Associated with Chronic Obstructive Pulmonary Disease in Two Racial Groups. Ann Am Thorac Soc.2017 Aug;14(8):1280–7.

[38] Bustamante-Marin XM, Ostrowski LE. Cilia and Mucociliary Clearance. Cold Spring Harb Perspect Biol.2017;9(4):a028241.

[39] Jiang C, Chen Q, Xie M. Smoking increases the risk of infectious diseases: A narrative review. Tob Induc Dis.2020; 18:60.

[40] Goltzman D. Functions of vitamin D in bone. Histochem Cell Biol. 2018;149(4):305–12.

[41] Polzonetti V, Pucciarelli S, Vincenzetti S, Polidori P. Dietary Intake of Vitamin D from Dairy Products Reduces the Risk of Osteoporosis. Nutrients.2020;12(6):1743.

[42] Bikle DD. Vitamin D: Newer Concepts of Its Metabolism and Function at the Basic and Clinical Level, Journal of the Endocrine Society.2020;4(2):1–20.

[43] Kalajian, T.A., Aldoukhi, A., Veronikis, A.J. et al. Ultraviolet B Light Emitting Diodes (LEDs) Are More Efficient and Effective in Producing Vitamin D3 in Human Skin Compared to Natural Sunlight. Sci Rep.2017; 7:11489.

[44] Xiong ZM, Mao X, Trappio M, Arya C, Kordi JE, Cao K. Ultraviolet radiation protection potentials of Methylene Blue for human skin and coral reef health. Sci Rep.2021;11(1):10871.

[45] Diffey BL. Time and Place as Modifiers of Personal UV Exposure. Int J Environ Res Public Health.2018;15(6):1112.

[46] Neale RE, Khan SR, Lucas RM, Waterhouse M, Whiteman DC, Olsen CM. The effect of sunscreen on vitamin D: a review. Br J Dermatol. 2019;181(5):907–15.

[47] Holick MF. Biological Effects of Sunlight, Ultraviolet Radiation, Visible Light, Infrared Radiation and Vitamin D for Health. Anticancer Research March 2016;36(3):1345–56.

[48] Kift R, Rhodes LE, Farrar MD, Webb AR. Is Sunlight Exposure Enough to Avoid Wintertime Vitamin D Deficiency in United Kingdom Population Groups?. Int J Environ Res Public Health.2018;15(8):1624.

[49] Lee YM, Kim SA, Lee DH. Can Current Recommendations on Sun Exposure Sufficiently Increase Serum Vitamin D Level?: One-Month Randomized Clinical Trial. J Korean Med Sci. 2020;35(8):e50.

[50] Solano F. Photoprotection and Skin Pigmentation: Melanin-Related Molecules and Some Other New Agents Obtained from Natural Sources. Molecules.2020;25(7):1537.

[51] Young AR, Narbutt J, Harrison GI, Lawrence KP, Bell M, O'Connor C, Olsen P, Grys K,

Baczynska KA, Rogowski-Tylman M, Wulf HC, Lesiak A, Philipsen PA. Optimal sunscreen use, during a sun holiday with a very high ultraviolet index, allows vitamin D synthesis without sunburn. Br J Dermatol.2019;181(5):1052–62.

[52] Hartley M, Hoare S, Lithander FE, et al. Comparing the effects of sun exposure and vitamin D supplementation on vitamin D insufficiency, and immune and cardio-metabolic function: the Sun Exposure and Vitamin D Supplementation (SEDS) Study. BMC Public Health.2015;15:115.

[53] Lee YM, Kim SA, Lee DH. Can Current Recommendations on Sun Exposure Sufficiently Increase Serum Vitamin D Level?: One-Month Randomized Clinical Trial. J Korean Med Sci.2020;35(8):e50.

Teikyo-1

ORIGINALITY REPORT

12%	9%	6%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Khalid M. AlGhamdi, Aeed S. AlAklabi, Abdulla Z. AlQahtani. "Knowledge, attitudes and practices of the general public toward sun exposure and protection: A national survey in Saudi Arabia", Saudi Pharmaceutical Journal, 2016 Publication	1%
2	www.naturalremedies.org Internet Source	1%
3	aakmira.blogspot.com Internet Source	1%
4	Submitted to Queen Mary and Westfield College Student Paper	1%
5	www.ncbi.nlm.nih.gov Internet Source	1%
6	www.ejmanager.com Internet Source	1%
7	Andrew J. Sandford, Peter D. Paré. "Genetic Risk Factors for Chronic Obstructive	1%

	Pulmonary Disease", Clinics in Chest Medicine, 2000 Publication	
8	"Sunlight, Vitamin D and Skin Cancer", Springer Science and Business Media LLC, 2020 Publication	<1 %
9	Submitted to Universiti Teknologi MARA Student Paper	<1 %
10	Submitted to Open University Malaysia Student Paper	<1 %
11	Submitted to King's College Student Paper	<1 %
12	ccsenet.org Internet Source	<1 %
13	webicdn.com Internet Source	<1 %
14	pdfs.semanticscholar.org Internet Source	<1 %
15	en.wikipedia.org Internet Source	<1 %
16	kuscholarworks.ku.edu Internet Source	<1 %
17	quizlet.com Internet Source	<1 %

18	Fernando de la Guía-Galipienso, María Martínez-Ferran, Néstor Vallecillo, Carl J. Lavie et al. "Vitamin D and cardiovascular health", Clinical Nutrition, 2021 Publication	<1 %
19	Vitamin D, 2016. Publication	<1 %
20	Fauna Herawati, Abdul Kadir Jaelani, Heru Wijono, Abdul Rahem, Setiasih, Rika Yulia, Retnosari Andrajati, Diantha Soemantri. "Antibiotic stewardship knowledge and belief differences among healthcare professionals in hospitals: A survey study", Heliyon, 2021 Publication	<1 %
21	jissn.biomedcentral.com Internet Source	<1 %
22	Meghan L Butryn, Mary K Martinelli, Jocelyn E Remmert, Savannah R Roberts, Fengqing Zhang, Evan M Forman, Stephanie M Manasse. "Executive Functioning as a Predictor of Weight Loss and Physical Activity Outcomes", Annals of Behavioral Medicine, 2019 Publication	<1 %
23	unllib.unl.edu Internet Source	<1 %
	www.dpcj.org	

24	Internet Source	<1%
25	www.jscimedcentral.com Internet Source	<1%
26	onlinelibrary.wiley.com Internet Source	<1%
27	www.wisegeek.com Internet Source	<1%
28	Negia Mohamed, Walid Al-Qerem, Ezeddin Gassar, Mohammad Hailat, Faiza Elhamdy, Jonathan Ling. "Students' "D"ILEMMA: An Assessment of Knowledge, Attitudes and Practice Toward Vitamin D Among University Students", Research Square, 2020 Publication	<1%
29	Tunjung Wibowo, Neti Nurani, Janatin Hastuti, Alifah Anggraini et al. "Maternal and Neonatal Factors Affecting Bone Mineral Content of Indonesian Term Newborns", Frontiers in Pediatrics, 2021 Publication	<1%
30	academic.oup.com Internet Source	<1%
31	eprints.usq.edu.au Internet Source	<1%
	res.mdpi.com	

32	Internet Source	<1%
33	researchbank.rmit.edu.au Internet Source	<1%
34	sites.kowsarpub.com Internet Source	<1%
35	worldwidescience.org Internet Source	<1%
36	www.mdpi.com Internet Source	<1%

Exclude quotes	On	Exclude matches	< 5 words
Exclude bibliography	On		