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Original Research

Assessment of knowledge and awareness of vitamin c deficiency and its effects on gingivitis among seafarers off Chennai port, Tamil Nadu, India – An exploratory analysis

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ABSTRACT:
The study aims to analyse the awareness of Gingivitis and iys harmful effects and their occupational risk of developing Vitamin C deficiency Chennai. **Materials and method used:** A cross-sectional study was conducted in a sample of 150 seafarers, both male and female aged 21 to 68 years off the ports of Chennai. The data was collected through a questionnaire containing21 questions. **Result:** 43.9% of the respondents are affected by symptoms of vitamin C deficiency and 66.7% of the respondents were aware of the tedious effects ofGingivitis associated with Vitamin C deficiency. **Conclusion:** Patients are more likely to develop Vitamin C deficiency with increased job experience meaning its a prevelant occupational hazard. The awareness and willingness to treat the associated Gingivitis is prevelant withinthe majority but only satisfactory and hence requires more protocals to educate them.
Keywords: Vitamin C, Scurvy, Gingivitis, bleeding gums, supplements, dailydosage, keratin pilaris, spontaneous bleeding

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INTRODUCTION

AIM

The aim of the study is to assess the knowledge and awareness of Vitamin C deficiency and its associated Gingivitis among seafarers off the portof Chennai.

Vitamins and its need: Vitamins are nutrients that are essential for various physiochemical processes in the body. Vitamins cannot be naturally processed within the body and hence requires supplementation from external enviroment. Vitamins are classified into two main categories(based on their solubility)-these are: water soluble (C and B complexes) and fat soluble vitamins (A, D, E, K) [3].

VITAMIN C

Also called ascorbic acid (AA) was isolated in 1923 for the first time by biochemist Szent-Gyorgyi and synthesized by Howarth and Hirst. It is seen in existence as its reduced [ascorbate] and oxidized forms as dehydroascorbic acid. This is easily inter-convertible and biologically active hence it acts as an essential antioxidant [3].

The body requires vitamin C for normal physiological functions. It allows for the conversion of cholesterol into bile acids which is why it lowers blood cholesterol levels [3]. It also allows for the absorption of iron in the gut by converting ferric to ferrous state. As an antioxidant, it acts against the effects of free radicals, pollutants and toxins on the body [3,5].

Deficiency of this vitamin is seen mainly as bleeding gums,infections,anemia, scurvy, poor wound healing, haemorrhage, muscle degradation and neurotic disturbances [7,8].

The main treatment modality is in the form of supplementation in large doses.Toxicity incase of this vitamin is rare on large doses even though it's a fat soluble vitamin. Vitamin C has a direct correlation with increased immunity as investigated in recent years [7,8].

SCURVY

Is a disease that results from deficient vitamin C levels(ascorbic acid). Early signs of lowered vitamin levels include weakness, soreness of limbsand fatigue. When left untreated, there is signs of decreased blood cell count(rbc), gum diseases, coarseness of hair, and spontaneous bleeding from the skin. As the disease progresses, there is decreased wound healing, change in overall mood of the individual and finally proves fatal from the associated infection or bleeding [3,5]. A month is the minimum time required to attain deficiency with a diet lacking in vitamin C[1,2,4,5]. Vitamin C is seen most in people suffering from alcoholism and unusual diet habits.

SIGNS AND SYMPTOMS

Early signs are fatigue and malaise.Beyond a month, theres evidence of shortness in breath and pain in joints and bones. Carnitine production is decreased which is why there is development of myalgia. Other symptoms include changes in skin texture, petechia or easily bruised skin, Gum degeneration,loosened tooth sockets, poor wound healingand mood swings. [6]

COMMON SIGNS

1. **Rough, Bumpy Skin**- Vitamin C has a major role in collagen synthesis, a protein that is required to form connective tissues like skin, hair, joints, bonesand blood vessels . When vitamin C is deficient, a skin disease known as keratosis pilaris can be seen .In this case, bumpy “chicken skin” forms on the back of the thighs or buttocks and upper arms as a result of buildup of keratin protein inside the pores[7].
2. **Bright Red Hair Follicles:** Hair follicles the skin surface contain many tiny blood vessels or capillaries that supply blood and nutrients to the associated area. When there is lowered levels of vitamin C, these small blood vessels become fragile and cause easy breakage thus forming small, bright red spots to seen around the hair follicles.This is called perifollicular hemorrhage and a well noted sign of severe vitamin C deficiency [7,11].
3. **Spoon-Shaped Fingernails With Red Spots or Lines**:Spoon-shaped nails are diagnosed by their concave shape and are commonly thin and brittle.They aremainly seen with iron deficiency anemia but have also been associated to vitamin C deficiency.
4. **Red spots or vertical lines in the nail bed:** known as splinter hemorrhage, may appear during vitamin C deficiency due to fragile blood vessels that haveruptured.
5. **Dry, Damaged Skin:**Healthy skin is a result of vitamin C, especially in the epidermis.Vitamin C keeps skin healthy by working against the damaging sun exposure,pollutants like smoke or uv rays along with increased collagen production and preventing oxidative damage. Thus skin is kept plump and youthful[9,10].
6. **Easy Bruising:**Bruising is seen as a result of the ruptured fragile blood vessels, causing blood to ooze and leak into the surrounding areas.
7. **Slowly Healing Wounds**:Vitamin C when lowered, lowers frequency of collagen production thus resulting in poor wound healing. Upon investigation, chronically unhealed leg ulcers indicate lowered vitamin C levels. In extreme cases, the wounds remain open and are prone to infection.
8. **Painful, Swollen Joints:** Joints contain connective tissue which as we know require collagen for its synthesis, hence is dependant on Vitamin C levels. On severe deficiency theres evidence of bone pain causing limping and severe joint pain.
9. **Weak Bones:** Vitamin C is involved in bone formation and hence linked to increased potential of fractures and osteoporosis. Vitamin C at young age is essential to make up the developing bone framework of the children skeleton.
10. **Bleeding Gums and Tooth Loss:** Red, swollen, bleeding gums are major sign of inadequate vitamin C, gum tissue becomes frail and inflamed and bloodvessels bleed easily. In advanced stages of vitamin C deficiency, gums may even be seen as purple and rotten. Consecutively, teeth could fall out due to unhealthy gums and weakened dentin which is the calcified inner layer of teeth.
11. **Poor Immunity:** Studies show that vitamin C accumalates itself insidevarious types of immune cells to help them fight against infection and eradicate disease-causing pathogens.In fact, many people with scurvy, eventually die of infection due to their poorly executing immune system.
12. **Persistent Iron Deficiency Anaemia**: Major tells of Iron deficiency anaemia include paleness, trouble breathing during exercise, fatigue, dry skin and coarse hair, headaches and spoon-shaped fingernails.Vitamin C levels being lowered affects absorption of iron and thus causes its deficiency.

Diagnosis is typically done from observing physical signs, Xrays, and improvement seen after supplementation.

Gingivitis is an inflammatory condition of the tissues of gingiva, it is mainly caused by bacterial infection. It differs from Periodontitis because theres lack of attachment and hence no migration of junctional epithelium. The conditionis isolated to soft tissue area of gingival epithelium and associated connective tissue. Gingival inflammation is very common and is thus classified by its clinical appearance, time of infection present,its severity and most importantlythe etiology. Chronic gingivitis is mainly due to plaque formation but on lowered vitamin C levels is due to the loosening of connective tissues and fragility of blood vessels associated[7,8].

Clinically its seen as redness, tenderness, swelling

with a shiny surface that bleeds on probing. It is mainly painless and hence not easily noticed by patients.

TREATMENT

Scurvy could be eradicated with doses of vitamin C as little as 10 mg per day, though doses of around 100 mg per day are mainly prescribed [7,8]. Most people make a full range recovery within 2 weeks.

- Direct replacement of vitamin C is key, with up to 300 mg daily for children and 500 mg to 1000 mg daily for adults. The endpoint is onemonth or upon resolution of clinical condition.
- In addition to immediate supplementation, educating the patient on lifestyle changes to ensure adequate intake, and recommended therapy for cessation of alcohol, and tobacco use.
- In the absence of a deficiency, daily requirements are atleast upto 45 mgper day in children, 90 mg per day for men, 75 mg per day for women, and up to 120 mg per day for women who are lactating.

When choosing food intake to increase levels in vitamin C, it is also importantto consider how food is prepared. Storing the food for long periods or cooking in a certain way can reduce the amount of vitamin C the food possesses. The best source of vitamin C is found when raw fruits and vegetables with high daily values are consumed on a regular. Cooking losses may be reduced by steaming the food.

DIETARY MANAGEMENT/FOOD SOURCES

Some foods may naturally contain Vitamin C and other foods are enriched with vitamins[2,4]. Many cereals and beverages are accumalated with vitamin C. Checking food labels can withold information on the amount of vitamin C present in the product. [1,5]

FRUITS AND VEGETABLES THAT CONTAIN HIGH AMOUNTS OF VITAMIN C

Fruits	Vegetables
Cantaloupe	Broccoli
Orange	Brussel Sprouts
Grapefruit	Cauliflower
Kiwi fruit	Spinach
Mango	Sweet and white potatoes
Papaya	Tomatoes and tomato juice
Pineapple	Winter squash
Strawberries	Green/red peppers
Raspberries	Turnip greens
Blueberries	Cabbage
Cranberries	
Watermelon	

METHODOLOGY

A pool of seafarers aged 21-68 was surveyed from Chennai between the monthof June to July 2023. The Sample set included both Male and Female seafarers. The Survey was conducted in the form of a questionnaire via google documents. The Survey comprises 21 multiple choice questions aiming to understand the patient's knowledge and degree of awareness regarding the effects of Vitamin C deficiency and its associated Gingivitis . The questionnaire recorded the details of the respondents like name, age, gender and ranking onboard.

RESULTS

CRITERIA	RESPONSE (n%)
What do you think is the most important vitamin forimmunity?	97(73.5%)
Vitamin C is also called 'ascorbic acid'	75(56.1%)
How much vitamin C must be consumed per day?	47(43%)
Symptoms of vitamin C deficiency include	53(42%)
Vitamin C causes what disease?	74(56%)
Have you ever taken Vitamin C supplements?	103(78%)
Vitamin C is seen highest in	93(63.7%)
Vitamin C is present in which of the following	67(43.2%)
How often do you consume these items with vitamins	74(53.8%)
Who is most likely to develop Vitamin C deficiency?	67(50.8%)

FIGURE.1. SHOWCASES SEAFARERS WHO HAVE EXPERIENCED BLEEDING GUMS WITHIN THE TIMELINE

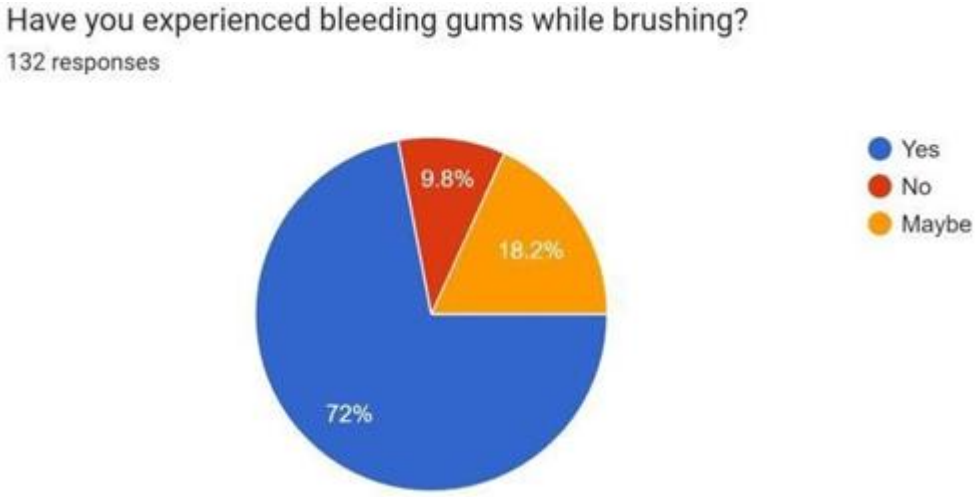


Figure 1 showcases that majority of these patients have experienced bleeding gums while brushing 72%(95), whereas 18.2%(24) are not sure about the presence of blood during brushing.

FIGURE.2. SHOWCASES SEAFARERS WHO ARE AWARE ABOUT THE TERM GINGIVITIS AND ITS EFFECTS

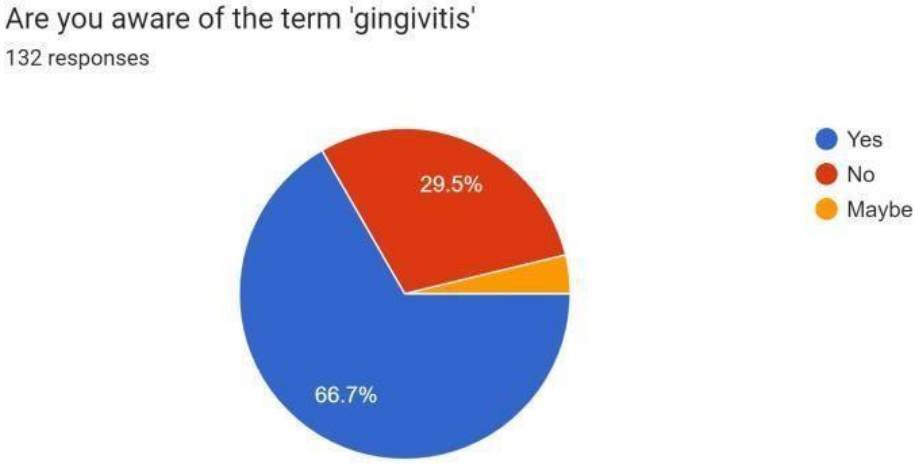


Figure 2 showcases that majority of seafarers are aware of the harmful effects of Gingivitisaround 66.7%(90).

FIGURE.3. SHOWCASES THE LAST DENTAL CHECKUP EACH SEAFARER HAS ATTENDED

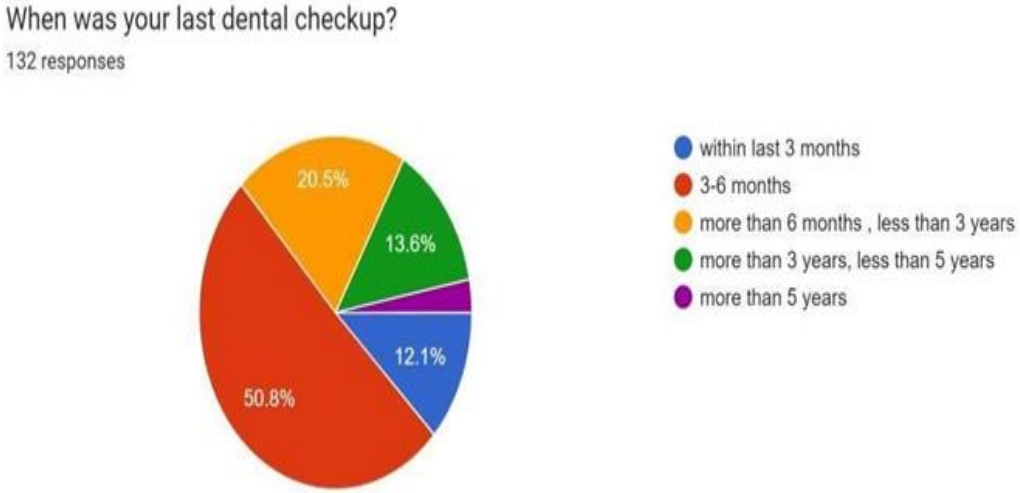


Figure 3 shows the majority 50.8%(70) have consulted a dental specialist within the last 3-6 months and were given proper diagnosis and treatment protocols.

FIGURE.4 SHOWCASES THE FREQUENCY AT WHICH THE SEAFARERS HAVE EXPERIENCED BLEEDING WHILE BRUSHING

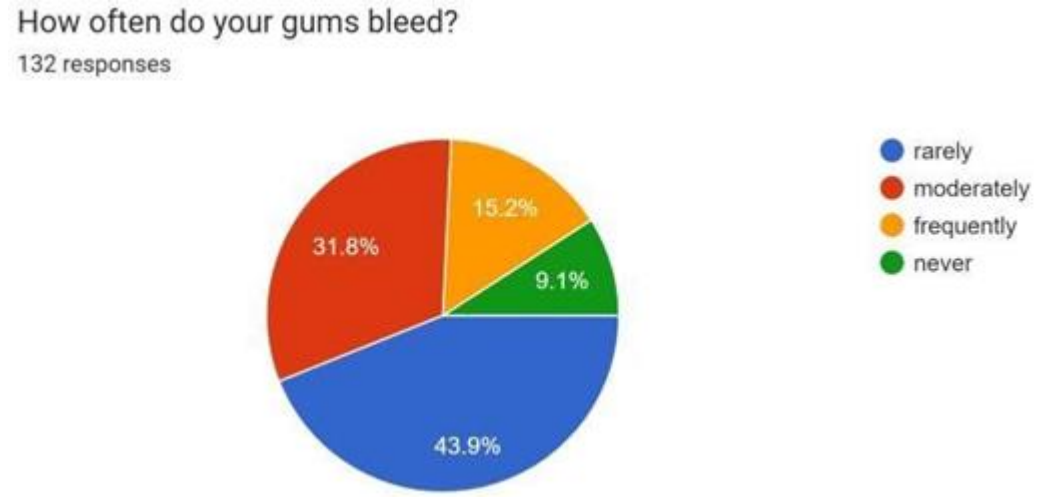
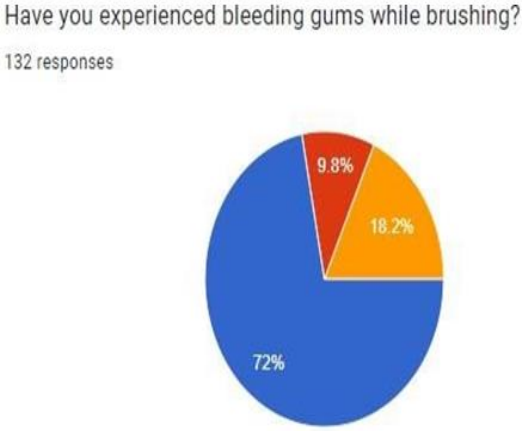


Figure 4 showcases that majority 43.9%(60) have rarely experienced bleeding and there is an increased prevelance of bleeding gums with increased age and job experience as seen by the 15.2%(23) who have moderate bleeding.

OBSERVATION AND CALCULATION

Participants that experienced bleeding	*95*
Total No. of Participants	*132*
% of Participants that experienced bleeding gums	72.0%

Z-statistic	5.0
ά	0.99998
p value	0.00001



Conculsion - we can say with 99.999% probability that a seafarer will have gingivitis

DISCUSSION

Vitamin C is an essential nutrient required for various physiochemical and biological processes. It needs external supplementation as it cannot be synthesised within the body. Deficiency of this vitamin is seen mainly as bleeding gums,infections,anemia, scurvy, poor wound healing, haemorrhage,muscle degradation and neurotic disturbances.

The main treatment modality is in the form of supplementation in large doses.Toxicity incase of this vitamin is rare on large doses even though it's a fat soluble vitamin.

Scurvy is thus a serious condition that could later prove fatal and its onset starts within the lack of proper Vitamin C consumption for a period of minimum 1 month[1]. It showcases many early symptoms of which are bleeding painless gums and gingivitis, bone pain, fatigue, roughened skin texture, dry eyes and coarse hair with spontaneous bleeding and severe cases lead to death upon infection due to decreased immunity.

- Luckily the symptoms are easily resolved on immediate supplementation and are given doses based on severity of signs and age groups with - 45 mg per day in children, 90 mg per day for men, 75 mg per day for women, and up to 120 mg per day for women who are lactating [1].

There is proof of recovery with doses as little as 10mg per day within 2 weeks,But the average amount to be consumed by an adult is 60-90 mg.

This dosage could be taken from raw vegetables and fruits rich in Vitamin C or by Oral supplements in tablet form. Dosage with accompanied education about the vitamin and the deleterious effects in its absence can increase overall awareness and decrease levels of scurvy in the population.

With this study we can conclude that there is a marked increase in Vitamin C deficiency among the

seafarers with experience and increasing age. Although there is readily available resources onboard ship the patients are majorly aware of the food rich in this essential vitamin.

The overall awareness of gingivitis associated with scurvy is satisfactory and the seafarers have received adequate dental professional help and treatment protocols with regards to the same.

In this study, out of 150 people that were surveyed, most of the people are concerned and conscious about the effects of Vitamin C deficiency and they are willing to seek dental help as well, but they only have a satisfactory awareness regarding gingivitis associated with Vitamin C deficiency and must be given proper education to overcome this very obvious occupational hazard.

CONCLUSION

There is a mixed perception on importance and effects of Vitamin C and its deficiency associated gingivitis. Although there is an overall majority in awareness , it still lacks adequate education with regards to how much of an occupational hazard Scurvy is among common seafarers. This calls for a need for more awareness on dental procedures and dental aesthetic treatments among the population.

This awareness and increased knowledge about dental treatments could be brought through media, social media, camps so that patients can seek help from the dentist and improve their smile and oral health care as well.

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