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Research Article

THE IMPACT OF CYANOBACTERIA ON HUMAN HEALTH

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Abstract: *The aim of the current study is, what are cyanobacteria, what are the types of cyanobacteria, what are their benefits to human health and the environment, what are the risks of cyanobacteria to human health. The questionnaire was created electronically via the Google Drive program, and then it was distributed via mobile phone on the social networking program (WhatsApp). Using e-mail for all participants to respond to the questionnaire. 600 questionnaires were distributed to all mobile groups, and 550 questionnaires were received on the researcher's e-mail. (The target group is residents of the Holy City of Mecca, aged 25-55 years).*

Keywords: *impact of cyanobacteria, human health*

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1-INTRODUCTION:

Cyanobacteria, cyanobacteria, or blue-green bacteria⁽¹⁾⁽²⁾ are a phylum of Gram-negative bacteria competent of photosynthesis, usually living in water. About two-thirds of the species studied are able of fixing nitrogen, and thus participate in the nitrogen period. Cyanobacteria include three pigments: green, blue, and red. The green dye is chlorophyll and it helps in the operation of photosynthesis. The blue color is what gives it its blue color, and the cause for this is due to the large presence of blue imbue within it. As for the red tincture, it is beta-carotene, and we deduce its presence from the flamingo. When the flamingo drinks water, cyanobacteria enter its body, and the pink color show on some parts of its body. Cyanobacteria are currently seeing a series of bacteria, so they are also called cyanobacteria. It has become obvious that they are not closely linked to plants. They are not concerning to plants in any way (contrary to what was expected), nor to fungi and animals. Cyanobacteria or cyanobacteria are a diverse group of Gram-positive bacteria. the harm of cyanobacteria output and the symbiosis of algae and bacteria⁽³⁾, and the nutrient effect of cyanobacteria blossom⁽⁴⁾. Cyanobacteria flowering will reason hypoxia in the water, as they amassed and rot, creating in different toxic secondary metabolites and other hurtful complexes (such as toxins, hydrogen sulfide, and odor substances)⁽⁵⁾, which have an influence on the watery flora and fauna, and the society building and quantity of microorganisms⁽⁶⁾. Cyanobacteria blooms not only harm aquatic creatures but also endanger human health. Direct or indirect connect with cyanobacterial toxins drive acute gastroenteritis, respiratory adverse reaction, skin rash, oral ulcer, and other illness⁽⁷⁾, and even induce cancer⁽⁸⁾. It is considered that cyanobacteria blooms form when the cyanobacteria reaches 105cells/mL, or the chlorophyll a (Chla) concentration reaches 10 µg/L, and a visible covering layer forms on the surface of the water⁽⁹⁾. The cyanobacteria blooms' decay process has a more serious impact on the aquatic environment. Aerobic and anaerobic reactions exist in the degradation process of cyanobacteria, and toxins and odorous gases are freed. During the decomposition of cyanobacteria blooms, a large number of organic substances and dissoluble nutrients will be released to water, which will lower the translucence of water, aggravate the eutrophication of water, and form "black spots"⁽¹⁰⁾. Cyanobacteria blooms will lead to the acidity of the water, the high trend of conductivity, the continuous raise in chemical oxygen request, and the rise in organic matter concentration in the water⁽¹¹⁾. In addition, organic debris created by cyanobacteria accumulation has a high decomposition rate in the

water, which can be decomposed by 41.9% within 48 h⁽¹²⁾, which will harm the ecosystem of the water^(9,13). A large amount of dissolved organic matter (DOM) is released during the decline of cyanobacteria, and with the progress of the reaction, dissolved organic carbon (DOC) is converted into dissolved inorganic carbon (DIC), and most of them are, lastly, turn into humus, which is challenging to degree. Impacts of Cyanobacteria Blooms on Human Health Cyanobacteria blooms directly impact drinking water. In 1996, in Caruaru, Brazil, 50 dialysis clinic patients died because of using water polluted with MCs⁽¹⁴⁾. In 1999, the cyanobacteria blooms in Dianchi Lake covered an area of 20 km². In May 2007, a massive cyanobacteria bloom in Taihu Lake (Wuxi, China) led to a drinking water crisis for 2 million people in the city of Wuxi⁽¹⁵⁾. In August 2014, cyanobacteria blooms in Lake Erie raised the concentration of MCs in the drinking water, threatening the drinking water safety of nearly half a million people⁽¹⁶⁾. When cyanobacteria blooms decompose, releasing many odor substances and cyanotoxins, it has been found that 2-methylisoborneol (MIB) and goemin are the most popular substances that cause odor (musty smell) in drinking water, and their odor sill concentrations are only 9 and 4 ng/L, respectively⁽¹⁷⁾.

2-MATERIAL AND METHODS:

The study started in (the holy city of Mecca in Saudi Arabia), began writing the research and then recording the questionnaire in June 2023, and the study ended with data collection in September 2023. The researcher used the descriptive analytical approach that uses a quantitative or qualitative description of the social phenomenon (The impact of cyanobacteria on human health). This kind of study is characterized by analysis, reason, objectivity, and reality, as it is concerned with individuals and societies, as it studies the variables and their effects on the health of the individual, society, and consumer, the spread of diseases and their relationship to demographic variables such as age, gender, nationality, and marital status. Status, occupation⁽¹⁸⁾, And use the Excel 2010 Office suite histogram to arrange the results using: Frequency tables Percentages⁽¹⁹⁾. A questionnaire is a remarkable and helpful tool for collecting a huge amount of data, however, researchers were not able to personally interview participants on the online survey, due to social distancing regulations at the time to prevent infection between participants and researchers and vice versa (not coronavirus participation completely disappearing from society). He only answered the questionnaire electronically, because the questionnaire consisted of nine questions, all of which were closed. The online approach has also been used

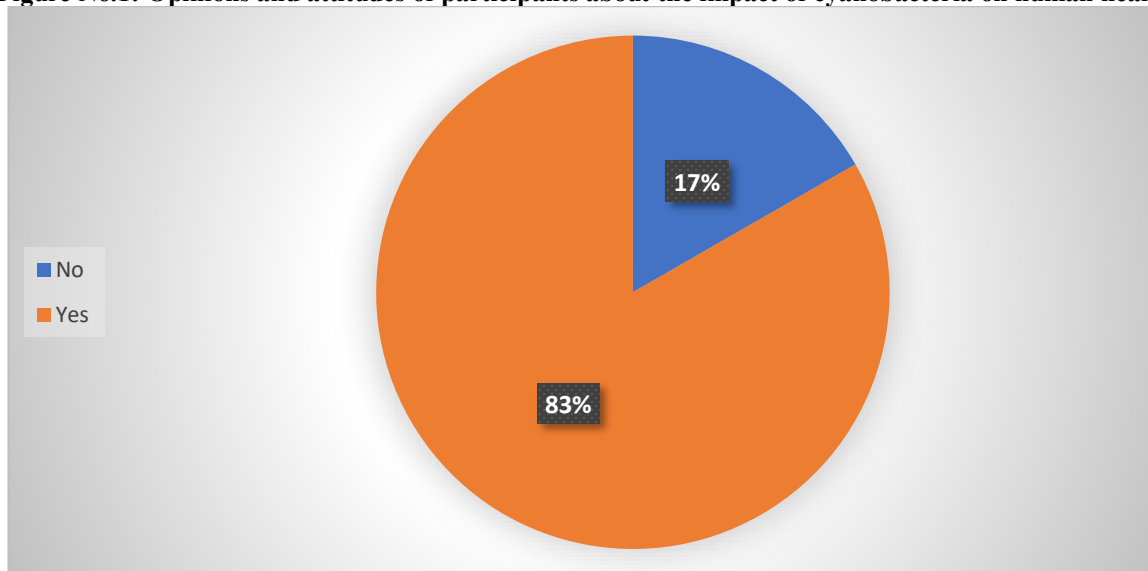
to generate valid samples in similar studies in Saudi Arabia and elsewhere⁽²⁰⁾

3- RESULTS AND DISCUSSION:

The participation rate in the research questionnaire among the residents of the city of Mecca was 100%, and was as follows: There was no participation from the age of 25-33 years at a rate of 30.1%, from 34-42 years at a rate of 35.7%, from the age of 43-51 years at a rate of 24.8%, while from the age of 52-60 years it was 9.4%. As for their gender, their percentage of males was 82.4%, while 17.6% of females. Their nationalities were all 100% Saudi, and as for their professions, they were as follows: 95% were government employees, while 3.5% were retired, accounting for 5.1%. As for their educational status, it was as follows: High school diploma and laboratory diploma 5.9%, master's degree 11.8%, health diploma 5.9%, general diploma 11.8%, university 29.4%, higher education 5.9%, bachelor's degree in science 5.9%, ordinary bachelor's degree 17.6%. Regarding the research questions, the participants' responses were as follows: The first question: Do Asco bacteria

help photosynthesis in plants? Yes 82.4% and no 17.6%. The second question: Cyanobacteria contain three pigments: green, blue, and red? Yes 88.2% and no 11.8%. The third question: Are cyanobacteria found in environmental sites such as soil, vegetables, sewage water, skin, and skin stains? Yes 70.6% and no 29.4%. The fourth question: One of the dangers of cyanobacteria is that it turns into a deadly weapon as a result of climate change: 76.5% and 23.5%. The fifth question: What are the benefits of cyanobacteria? It helps plants grow and obtain clean, oxygen-filled air? 70.6% and 29.4%. The sixth question: What types of cyanobacteria are: Spirulina (food supplement), Spirulina ordonesii, Spirulina agillus, stromatolite? Yes 76.5% and no 23.5%. The seventh question: Do cyanobacteria reproduce asexually through cell division? Yes 93.8% and no 6.2%. The eighth question about the importance of cyanobacteria is that it produces intracellular and extracellular substances: antifungal, antiviral, anticancer, antioxidant, and antibiotic for bacteria (Gram positive)? Yes 82.4% and no 17.6%. (Figure No.1)

Figure No.1: Opinions and attitudes of participants about the impact of cyanobacteria on human health



4-CONCLUSION:

The importance of cyanobacteria for humans, as they provide plants with oxygen that humans benefit from in their lives, and they also help plants grow, and this is considered a positive aspect.

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