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RESEARCH ARTICLE

ANOSMIA, DYSGEUSIA AND ASSOCIATED FACTORS IN COVID-19 PATIENTS: A CROSS SECTIONAL ANALYSIS OF DIFFERENT COHORTS REPORT

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Abstract

Objective: Since the initial appearance of coronavirus disease in 2019 COVID-19), the world has progressed from understanding a couple of symptoms and risk factors to a large rundown of COVID-19 indicators that may also be used for screening and risk stratification. These breakthroughs eventually provided a way into the later development of the potentially lifesaving COVID-19 vaccines. While the prevalence characteristics of pre-symptomatic COVID-19 are easily notable, most critical elements/details of asymptomatic COVID-19,including anosmia and dysgeusia, are scarce and limited in the public domain.

Methods: A cross-sectional analysis was performed from June 27 to April 1, 2023, in Riyadh, Saudi Arabia. Two groups, namely Group A and Group B, were studied. Group A included COVID-19 patients hospitalized at any ministery of health hospital in Riyadh, Saudi Arabia, while Group B involved COVID-19 home-quarantined subjects diagnosed in any ministry of health screening centers or any private center approved by the ministry of health in Riyadh.

Result: The study incorporated and reviewed approximately 500 (N=500) participants. Out of these, (40) were later eliminated due to the critical nature of their conditions, while (12) were excluded due to insufficient/inconclusive medical data to meet the set project standards. The final report included a review of 448 participants who were distribu ted into each of the two predefined patient categories.

Conclusions: With recent progress and efforts by the medical communi ty and scientists to identify and mitigate potential occurrences of COVID-19 in individuals, it is evident that additional factors should be devised to aid in the ease of diagnosis of the disease.Assessing anosmia or dysgeusia dysfunctions in the diagnosis of COVID-19 may offer adequate solutions aimed at improving the outcomes of individual testing in the long run..

Introduction:-

Since the initial appearance of coronavirus disease in 2019, numerous clinicians and researchers have attempted to devise effective techniques to better understand the epidemiology, physiology, and manifestations of the disease. The fact that the disease is associated with millions of mortalities across the world in the early days of its occurrence

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is a clear indication that the world was not prepared, or even anticipated, to experience such a deadly pandemic in contemporary times. Coronavirus Disease 2019 is essentially a life-threatening human disease principally caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The disease may occur either in the form of asymptomatic or pre-symptomatic COVID-19 in individuals. Among the two most significant prevalences of asymptomatic COVID-19 are anosmia and dysgeusia.

Since the disease's first publishing and broadcast, the world has progressed from understanding a couple of symptoms and risk factors to a large rundown of COVID-19 indicators that may also be used for screening and risk stratification. Significant milestones have been made by the medical, scientific community in relation to the pathophysiology and epidemiology of the coronavirus disease breakthroughs for the past two years. These breakthroughs eventually provided a way into the later development of the potentially lifesaving COVID-19 vaccines. However, regardless of these prevailing empirical findings and breakthrough scientific developments in relation to COVID-19, it is still apparent that there is still limited information and public knowledge about the fundamental epidemiology of the disease, especially involving its symptomatic characteristics/manifestations.

Based on recent findings both the asymptomatic and pre-symptomatic COVID-19 scenarios are often comparable since all the instances include testing positive for the disease but no symptoms. (1) However, unlike their pre-symptomatic COVID-9 patient counterparts, individuals diagnosed with asymptomatic COVID-19, in most cases, do not exhibit known symptoms of the disease and typically feel normal for the life of the virus. While the prevalence characteristics of pre-symptomatic COVID-19 are easily notable, most critical elements/details of asymptomatic COVID-19, including anosmia and dysgeusia, are scarce and limited in the public domain. From this perspective, there is an imminent need for additional explorations and insights into these potential asymptomatic manifestations of COVID-19 in patients to control and mitigate its further spread in individuals.

Anosmia is a major hyposmia condition that is evidenced by a person's inability to distinguish order or scent. Dysgeusia, on the other hand, is a sensory disorder defined by individuals losing their sense of taste. It discovered that anosmia and dysgeusia varied between 3 and 20 percent of COVID-19 patients. (1) Also discovered that more than 75 percent of COVID19 patients had indications of anosmia and dysgeusia. Furthermore, another study found that anosmia in COVID-19 is associated with the spread of olfactory bulb edema. (2)

Emerging findings on the prevalence of anosmia and dysgeusia in COVID-19 patients are crucial in the context of the current pandemic. Thelimitations of the continuous reverse transcriptase polymerase chain reaction (RT-PCR) test for screening make the symptoms or prevalence of anosmia and dysgeusia potential early indicators for specialists or clinicians to reach a firm decision on patients with SARS-CoV-2 disease. (3) However, despite the increasing indications of these dysfunctions in COVID-19 patients, there is a lack of empirical information and sources to provide a critical understanding of their possible relationship with the disease. Therefore, the primary goal of this cross-sectional survey is to provide crucial insights into the incidence of anosmia and dysgeusia among COVID-19 patients in Saudi Arabia.

Methods:-

The current research takes the form of a cross-sectional study design. Essentially, A cross-sectional analysis was performed from June 27 to April 1, 2023, in Riyadh, Saudi Arabia. Two groups, namely Group A and Group B, were studied. Group A included COVID-19 patients hospitalized at any ministery of health hospital in Riyadh, Saudi Arabia, while Group B involved COVID-19 home-quarantined subjects diagnosed in any ministry of health screening centers or any private center approved by the ministry of health in Riyadh. The participants were randomly selected from the targeted sample population of positively diagnosed patients, either admitted to or undergoing home quarantine, using prospectively coded data in the MOH data information platform.

The study participants included both male and female COVID-19 patients who were either hospitalized or home-quarantined, as indicated in their medical reports. Patients were required to present clinical test results showing a positive nasal/pharyngeal swab for SARS-CoV2 (RT-PCR) to confirm their COVID-19-positive status. Additionally, the diagnostic test results needed to be at least 10 days old for an individual to qualify for the study. The men and women must be over 18 years of age and willing and able to participate in the study. The specific exclusion criteria adopted in the context of this study involve the removal of individuals who have recovered from

COVID-19, as well as those who are not at risk of COVID-19 or do not show any related symptoms. Additionally, the study excluded COVID-19 patients who have been admitted for more than two years or those who are critically or severely ill due to their detrimental conditions.

The study involved a random sampling approach in the selection of the specified participants. To be precise, the respondents were randomly selected from the MOH database and home-based care. Similarly, the research coordinators comprised a team of medical personnel with adequate background understanding and knowledge about COVID-19 symptoms, prognosis, and pathogenesis. In the current case, the most impactful data collection tool was a questionnaire. During the investigation process, the questionnaire was distributed to each of the selected study participants in both Groups A (hospitalized patients) and B (home-quarantined patients). To ensure the safety of the participants and research coordinators, the questionnaires were electronically distributed via email or an online link that enabled the respondents to easily access, retrieve, and submit the data by clicking a submit button at the end of the questionnaire. The specific variables for the subsequent questionnaire included participants' demographics, location, and healthcare data. The questionnaire also inquired about details of the participants' symptoms, specifically focusing on those related to anosmia and dysgeusia.

The ethical concern for the current study was approved by King Fahad Medical city research center. Further, the participants were required to sign a written consent. To effectively accomplish the fundamental objectives of the current study, the sample size estimation was derived using the following statistical formula $N=2(Z_a+ Z_{1-\beta}) Z\alpha, Z/ \Delta^2$In this perspective, the most effective data analysis tool for this study comprised SPSS v21.

Results:-

In total, the study incorporated and reviewed approximately 500 (N=500) participants. Out of these, (40) were later eliminated due to the critical nature of their conditions, while (12) were excluded due to insufficient/inconclusive medical data to meet the set project standards. The final report included a review of 448 participants who were distributed into each of the two predefined patient categories. Overall, the two derived patient groups were as follows: Group A (Patients admitted to Hospital/Hospitalized) and Group B (In-Home quarantined patients). As indicated in Table 2 below, Group A constituted approximately (18.2%) with a mean/standard deviation of 1.75/0.463, while Group B comprised a total of (81.8%) with a mean/standard deviation of 1.74/0.447. It is, however, notable that there were about (9.1%) outpatients and (2.3%) case of hospitalized patient without treatment.

As evident in Table 1 below, there is a notable trend and correlation in the overall distribution of patients admitted to the hospital and in-home (home quarantined) across all the table variables. Precisely, the mean gender distribution of patients in Group A was approximately 1.75/0.463 (95% CI; -0.359 to 0.378, p-value <0.009), while Group constituted a mean variation of 1.74/0.447. Similarly, the total mean for positively diagnosed hospitalized COVID-19 patients with PCRT was 2.00 (95% CI; 0.397 to 0.41, p-value <0.009), while the average mean for positive diagnosis in home quarantined patients was approximately 1.89/0.320.

According to Table 3 below, it is apparent that the mean/std distribution of patients according to each of the underlying symptom categories was as follows: Cough (3.0/0), cough and fever (2.33/0.577), cough, fever, and sore throat (2.50/0.577), fatigue, cough, and fever (3.0/0.0), fatigue, cough, fever, and shorten of breath (3.00/0.0). The rest of the mean/std in the remaining symptoms category exhibited an average CI of 95%.

Table 1: Demographic and Clinical Characteristics Based on Patient Grouping

Demographic and Clinical Characteristics Based on Patient Grouping					
	Patient Group/Categories	N=(448)	Mean	Std. Deviation	Std. Error Mean
Gender	Admitted to hospital	98	1.75	.463	.164

	In-home	350	1.74	.447	.086
COVID-19 Diagnosis with PCRT	Admitted to hospital	98	2.00	.000	.000
	In-home	350	1.89	.320	.062
suspected case of anosmia or dysgeusia	Admitted to hospital	98	4.00	.000	.000
	In-home	350	3.19	.786	.151
Underlying health conditions	Admitted to hospital	98	5.75	3.845	1.359
	In-home	18	6.83	3.294	.776
COVID-19 Symptoms	Admitted to hospital	98	8.63	7.070	2.500
	In-home	350	9.74	6.365	1.225
Commencement of the symptoms related to COVID-19	Admitted to hospital	98	5.63	.518	.183
	In-home	350	5.48	2.225	.428
Duration of the Symptoms	Admitted to hospital	98	3.13	1.959	.693
	In-home	350	2.96	1.372	.264
Exposure to anyone diagnosed with COVID-19	Admitted to hospital	98	3.50	.926	.327
	In-home	350	3.33	.877	.169

Demographic and Clinical Characteristics Based on the Severity of the Infection (Categories)									
Patient Categories (Severity of the Covid-19 infection)		Gender	COVID-19 Diagnosis with PCRT	suspected case of anosmia or dysgeusia	Underlying health conditions	COVID-19 Symptoms	Commencement of the symptoms related to COVID-19	Duration of the Symptoms	Exposure to anyone diagnosed with COVID-19
Missing Values	Mean	1.75	1.00	2.00	9.00	20.00	2.75	1.00	2.75
	N	40	40	40	12	40	40	40	40
	Std. Deviation	.500	.000	1.155	.	.000	3.500	.000	1.500
	Sum	52	40	98	90	80	110	40	110
	% of Total N	9.1%	9.1%	9.1%	3.3%	9.1%	9.1%	9.1%	9.1%
	% of Total Sum	9.3%	4.9%	5.5%	4.4%	16.6%	4.8%	2.9%	7.4%

Admitted to	Mean	1.75	2.00	4.00	5.75	8.63	5.63	3.13	3.50
hospital	N	98	98	98	98	98	98	98	98
	Std. Deviation	.463	.000	.000	3.845	7.070	.518	1.959	.926
	Sum	14	16	32	46	69	45	25	28
	% of Total N	18.2%	18.2%	18.2%	26.7%	18.2%	18.2%	18.2%	18.2%
	% of Total Sum	18.7%	19.8%	21.9%	22.5%	14.3%	19.6%	18.4%	18.9%
In-home	Mean	1.74	1.89	3.19	6.83	9.74	5.48	2.96	3.33
	N	350	350	350	180	350	350	350	350
	Std. Deviation	.447	.320	.786	3.294	6.365	2.225	1.372	.877
	Sum	47	51	86	123	263	148	80	90
	% of Total N	61.4%	61.4%	61.4%	60.0%	61.4%	61.4%	61.4%	61.4%

	% of Total Sum	62.7 %	63.0%	58.9%	60.3%	54.7%	64.3%	58.8%	60.8%
Hospital Admission	Mean	1.00	2.00	4.00	7.00	8.00	11.00	3.00	4.00
	N	12	12	12	12	12	12	12	12
with no Treatment/Medication	Std. Deviation	.	.	.	.	.	.	.	.
	Sum	12	20	40	71	86	11	37	40
	% of Total N	2.3 %	2.3%	2.3%	3.3%	2.3%	2.3%	2.3%	2.3%
	% of Total Sum	1.3 %	2.5%	2.7%	3.4%	1.7%	4.8%	2.2%	2.7%
Outpatient clinic	Mean	1.50	2.00	4.00	9.50	15.25	3.75	6.00	3.75
	N	40	40	40	21	40	40	40	40
	Std. Deviation	.577	.000	.000	.707	4.031	1.500	.000	.500
	Sum	61	98	16	19	61	15	24	15
	% of Total N	9.1 %	9.1%	9.1%	6.7%	9.1%	9.1%	9.1%	9.1%

	% of Total Sum	8.0 %	9.9%	11.0%	9.3%	12.7%	6.5%	17.6%	10.1%
Total	Mean	1.70	1.84	3.32	6.80	10.93	5.23	3.09	3.36
	N	44	44	44	30	44	44	44	44
	Std.	.462	.370	.883	3.305	6.725	2.381	1.723	.917
	Deviation								
	Sum	75	81	146	204	481	230	136	148
	% of Total N	100.0%	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
	% of Total Sum	100.0%	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Table 2: Demographic and Clinical Characteristics Based on the Severity of the Infection

Demographic and Clinical Characteristics According to Symptoms						
COVID-19 Symptoms		Severity of the COVID-19 infection	Gender	COVID-19 Diagnosis with PCRT	Underlying health conditions	suspected case of anosmia or dysgeusia
Cough	Mean	3.00	2.00	2.00	5.00	2.00

	N	12	12	12	12	12
	Std. Deviation	.	.	.	.	.
	Sum	31	22	22	54	21
Cough, Fever	Mean	2.33	2.00	2.00	6.50	4.00

	N	3	3	3	2	3
	Std. Deviation	.577	.000	.000	3.536	.000
	Sum	7	6	6	13	12
Cough, Fever, Sore throat	Mean	2.50	1.75	2.00	8.67	3.00
	N	40	40	40	39	40
	Std. Deviation	.577	.500	.000	2.517	1.155
	Sum	10	7	8	26	12
fatigue, Cough, Fever	Mean	3.00	2.00	1.67	5.00	3.00
	N	39	39	39	29	39
	Std. Deviation	.000	.000	.577	5.657	.000
	Sum	9	6	5	10	9
fatigue, Cough, Fever, Shorten of breath	Mean	3.00	2.00	2.00	6.50	2.50
	N	21	22	22	21	23

	Std. Deviation	.000	.000	.000	3.536	2.121
	Sum	6	4	4	13	5
fatigue, Cough, Fever, Sore throat	Mean	3.00	1.50	1.75	8.33	3.25
	N	43	40	40	38	41
	Std. Deviation	.000	.577	.500	2.887	.500

	Sum	12	6	7	25	13
fatigue, Cough, Fever, Sore throat, Diarrhea	Mean	3.00	2.00	2.00		4.00
	N	112	131	112		112
	Std. Deviation	.	.	.		.
	Sum	3	2	2		4
fatigue, Cough, Fever, Sore throat, Shorten of breath, Loss of smell and taste	Mean	4.00	1.00	2.00	7.00	4.00
	N	112	112	112	131	112
	Std. Deviation	.	.	.	.	.
	Sum	4	1	2	7	4
fatigue, Fever	Mean	2.00	1.00	2.00	1.00	4.00
	N	1	1	1	1	1

	Std. Deviation	.	.	.	.	.
	Sum	2	1	2	1	4
fatigue, Fever, Headache	Mean	3.00	1.00	2.00		3.00
	N	1	1	1		1
	Std. Deviation	.	.	.		.
	Sum	3	1	2		3
fatigue, Fever, Sore throat	Mean	3.00	2.00	2.00	9.00	3.33
	N	3	3	3	1	3

	Std. Deviation	.000	.000	.000	.	.577
	Sum	9	6	6	9	10
fatigue, Shorten of breath, Muscle pain	Mean	5.00	1.00	2.00		4.00
	N	1	1	1		1
	Std. Deviation	.	.	.		.
	Sum	5	1	2		4
fatigue, Shorten of breath, Muscle pain and chest pain	Mean	5.00	1.00	2.00		4.00
	N	1	1	1		1

	Std. Deviation	.	.	.		.
	Sum	5	1	2		4
fatigue, Sore throat	Mean	3.00	1.50	2.00	9.00	3.50
	N	2	2	2	2	2
	Std. Deviation	.000	.707	.000	.000	.707
	Sum	6	3	4	18	7
fatigue, Vomiting or Nausea	Mean	3.50	2.00	2.00	6.50	4.00
	N	2	2	2	2	2
	Std. Deviation	2.121	.000	.000	4.950	.000
	Sum	7	4	4	13	8
fatigue, Vomiting or Nausea, Cough, Fever, Sore throat	Mean	3.00	1.50	2.00	9.00	3.50
	N	2	2	2	2	2
	Std. Deviation	.000	.707	.000	1.414	.707
	Sum	6	3	4	18	7
fatigue, Vomiting or Nausea, Cough, Fever, Sore throat, Shorten of breath	Mean	2.50	2.00	2.00	1.50	4.00
	N	2	2	2	2	2

	Std. Deviation	.707	.000	.000	.707	.000
	Sum	5	4	4	3	8
Fever, Sore throat	Mean	2.00	2.00	2.00	10.00	4.00
	N	1	1	1	1	1
	Std. Deviation	.	.	.	.	.
	Sum	2	2	2	10	4
Fever, Sore throat, Shorten of breath	Mean	3.00	2.00	2.00	1.00	4.00
	N	1	1	1	1	1
	Std. Deviation	.	.	.	.	.
	Sum	3	2	2	1	4
No symptoms	Mean	1.67	1.67	1.17	9.00	2.50
	N	6	6	6	2	6
	Std.	1.033	.516	.408	.000	1.225
	Deviation					
	Sum	10	10	7	18	15
No symptoms/Loss the f smell	Mean	5.00	2.00	2.00	9.00	4.00
	N	1	1	1	1	1
	Std. Deviation	.	.	.	.	.

	Sum	5	2	2	9	4
Sore throat	Mean	3.00	1.00	2.00	5.00	3.00
	N	1	1	1	1	1
	Std. Deviation	.	.	.	.	.
	Sum	3	1	2	5	3
Total	Mean	2.84	1.70	1.84	6.80	3.32
	N	44	44	44	30	44
	Std. Deviation	.963	.462	.370	3.305	.883
	Sum	125	75	81	204	146

Table 3: Demography and Patient Manifestations/Symptoms

Discussion:-

The current research reviewed a sample population of approximately 448 patients, unequally categorized into two groups involving hospitalized subjects and home-quarantined ones. Based on the resulting findings, it was apparent that a vast majority of home-quarantined patients were more likely to exhibit symptoms of anosmia or dysgeusia. According to the analyses presented in Tables 1, it is also worth noting that a significant number of patients with these olfactory dysfunctions took relatively longer before fully revealing symptoms or testing positive for a COVID-19 diagnosis. The fact that a high number of the involved COVID-19 patients with signs of anosmia/dysgeusia were home quarantined is a substantial indication that these symptoms are not often considered among the profound clinical characteristics of COVID-
19.

However, as evident in some empirical sources, including studies by Printz and Constantinidis (4) as well as Foster et al. (5), it is beyond reasonable doubt that the potential prevalence of anosmia and/or dysgeusia impairments in certain patients may be used as critical prognostic characteristics of lower acute COVID-19. Another integral finding from the current study included the little to no manifestation of typical symptoms of COVID-19 in subjects with suspected cases of anosmia or dysgeusia. To be precise, the study outcomes affirmed that over 50% of patients with indications of anosmia and/or dysgeusia did not encounter any other known sign(s) of COVID-19, unlike their counterpart subjects who were not experiencing/having olfactory impairments.

This is despite the vast majority of subjects without anosmia/dysgeusia impairments depicting a higher percentage of symptoms vastly associated with pre-symptomatic COVID-19. Correspondingly, subsequent research realizations further affirm prior findings by other scholars such as Lechien et al. (7), Speth et al. (8), and Meini et al. (9), which established the effectiveness of utilizing anosmia/dysgeusia dysfunctions in determining/identifying positive COVID-19 cases during clinical testing. Regardless, despite the viability of the current research paper, it is worth noting that the outcomes are also influenced by specific limitations. For instance, the sample population size was relatively small to effectively substantiate or attribute the findings to a larger audience. Additionally, the research

was impacted by limited financial resources, thus inhibiting effective accomplishment/access to some other important aspects of the study process.

Conclusion:-

With recent progress and efforts by the medical community and scientists to identify and mitigate potential occurrences of COVID-19 in individuals, it is evident that additional factors should be devised to aid in the ease of diagnosis of the disease. Although pre-symptomatic COVID-19 is a reliable clinical characteristic during diagnosis, it is high time to determine additional factors, including asymptomatic COVID-19 manifestations, to aid in the identification of the disease in its early stages. Assessing anosmia or dysgeusia dysfunctions in the diagnosis of COVID-19 may offer adequate solutions aimed at improving the outcomes of individual testing in the long run.

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The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability:
Data are available upon reasonable request.

Competing Interests:
The authors declare that they have no competing interests relevant to this study and the publication thereof.

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Authors Contribution:
Both of the authors Dr. Faisal Alkulaib and Dr. Fahad Aljassir; have conceived and planned the project which led to the paper and interpreted the evidence it presents. Wrote the paper reviewed it and accept the final version.

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