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## The Prevalence of Dysphagia in Patients with Covid-19: A Systematic Review and Meta-Analysis

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**ABSTRACT:** The world has been suffering from COVID-19 since 2019. It is thought that there's a high risk of dysphagia in patients with COVID-19. Therefore, the purpose of this study was to estimate the prevalence of dysphagia in patients affected by COVID-19 in admission (day 0), discharge, and 3-6 months post-discharge. Only English papers reporting dysphagia in COVID-19 patients were included. Case reports and review studies were excluded. The authors searched Web of Science, Google Scholar, Scopus, and PubMed from January 1, 2020, until July 1, 2022. In this study, the effect sizes and standard errors were used to estimate the amount of dysphagia in these patients. Random effects were used for statistical analysis. Of the 2736 identified studies, 19 articles (n = 5334 patients) were included in the meta-analysis. The pooled prevalence of dysphagia in COVID-19 patients at admission (n=643 patients), discharge (n=2286 patients), long-term (n=2405 patients), and the total was 32% (SE=0.13), 29% (SE=0.04), 14% (SE=0.03), and 24% (SE=0.03), respectively. About a quarter of COVID-19 patients may have dysphagia during the acute phase and/or also in the post-acute phase of the disease. Therefore, one should be aware of the symptoms of dysphagia and treat it in time.

**KEYWORDS:** Prevalence; Dysphagia; Swallowing; COVID-19; Meta-analysis; Review

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### INTRODUCTION

The Coronavirus disease-2019 (COVID-19), caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) has resulted in a worldwide catastrophic healthcare issue, with serious social, economic, and health problems [1]. The high number of COVID-19 patients has caused a great number of hospital and intensive care unit (ICU) admissions [2]. The SARS-CoV-2 virus causes damage to the heart, digestive system, lungs, peripheral and central nervous system, and other tissues in some diseased people [3, 4]. Its transmission through contact, fomites, respiratory droplets, and aerosols has facilitated the quick spread worldwide [1]. The most common manifestations appear to be sore throat, fever, cough, fatigue, and breathing difficulties [5-7]. COVID-19 can cause life-threatening conditions in older patients or those with respiratory or cardiac diseases, which can result in the development of Acute Respiratory Distress Syndrome (ARDS) [1, 6]. Besides these common manifestations of COVID-19, a few studies on clinical features of these patients have reported a number of symptoms and disorders related to speech and swallowing, such as dysphagia and dysphonia [3, 4, 6, 8-10].

Dysphagia in patients affected by COVID-19 seems to result from breathing-swallowing incoordination [11]. A study examined the relationship between COVID-19 and dysphagia exhibited that the manifestations of COVID-19, like ARDS, neurological manifestations, loss of taste, dyspnea, and tachypnea, as well as treatment actions for this disease, including oxygen therapy, non-invasive mechanical ventilation, intubation, tracheostomy, and drugs used in the ICUs setting, affect swallowing efficiency. Negatively [12]. However, there is still much unknown about the underlying processes of COVID-19-related swallowing disorders, and further research is needed [13, 14].

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Dysphagia prevalence in patients diagnosed with COVID-19 ranges from 7% [7] to 90% in different studies [8]. Martin-Martinez et al. [15] in 2021, investigated the prevalence of dysphagia in 205 patients affected by COVID-19 admitted to the ward of a hospital placed in Spain. The study reported that the prevalence of dysphagia at admission was 51.7% according to Volume-Viscosity Swallowing Test (V-VST) and Eating Assessment Tool-10 (EAT-10). Mallart et al. [9] in France, conducted a cohort study of patients with COVID-19 admitted to the ICU to explore the prevalence of dysphagia. The study found 22% of the patients had dysphagia on discharge. Other researchers discovered a different dysphagia prevalence due to COVID-19, with Regan et al. reporting a prevalence of 84% and Cerutia et al. reporting 54.8% [4, 16].

In some cities, sometimes because of the lack of diagnostic kits, COVID-19 diagnosis relies on evaluating the main clinical symptoms [17]. Although some COVID-19 patients might not visit a physician, so Speech and Language Pathologists (SLPs) should be completely aware of these symptoms in order to be capable of taking the necessary actions. As the number of COVID-19 patients increases around the world [3], it is necessary for all clinicians, including SLPs, to be informed about the leading clinical manifestations of COVID-19 patients. Based on the previous data, some researchers have reported dysphagia along with other common symptoms of this disease, but these studies' results are contradictory. On the other hand, dysphagia may lead to complications such as pneumonia, malnutrition, dehydration, increased length of hospitalization, and mortality and a negative impact on quality of life [13, 18]. So, it is needed that the impact of COVID-19 on this function be studied so early identification and management can be provided. The available studies have investigated different strains of COVID-19 and different strains have different effects on organs such as the brain and human functions. However, these studies were carried out at different time points after the infection of these patients. These are reasons for the difference in reported dysphagia rates. To the best of the author's knowledge, no meta-analysis study reported the presence of dysphagia in COVID-19 patients admitted to hospitals and during the follow-up time. This may give us a view of the period of time (admission to hospital, discharge, or long-term) in which the prevalence of dysphagia is higher in these patients. Therefore, the present study was designed to estimate the prevalence of dysphagia in COVID-19 patients at three different time points: at admission, at discharge, and 3-6 months post-discharge or after their positive SARS-CoV-2 test result.

## MATERIALS AND METHODS

### Search strategy

The authors reported this research based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and with PROSPERO registration number: CRD42023405377 [19]. For finding relevant studies, four famous medical databases, including PubMed, Web of Science, Scopus, and Google Scholar were searched from January 1, 2020, until July 1, 2022. The search terms were applied according to English MeSH keywords: [COVID-19 AND dysphagia] OR [COVID-19 AND Deglutition] OR [SARS-CoV-2 AND Swallowing disorder] OR [Coronavirus AND Prevalence] OR [Coronavirus AND Incidence] OR [Wuhan Coronavirus AND Characteristics] OR [new coronavirus AND characteristics]. Furthermore, the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) portals were appraised as national public health organizations.

### Inclusion and exclusion criteria

Any related paper that reported dysphagia in patients affected by COVID-19 at the time of admission, at the time of hospital discharge, or 3-6 months post-discharge or after their positive SARS-CoV-2 test result, was entered into this analysis. All article designs (cross-sectional studies, case-control studies, non-randomized controlled trials, and randomized controlled trials) were entered. Only articles in English were entered and reviewed. Review studies were excluded from this study. Since the sample numbers are important in meta-analysis research, case report articles were excluded too. Only the characteristics of adult patients were included.

### Data extraction and paper quality evaluation

The first and second authors separately extracted and evaluated the data. Two researchers separately extracted the country of implementation, year of publication, sample size, average age, gender, dysphagia assessment method, and the number of patients who had dysphagia from the articles that met the inclusion criteria and entered them into a table. After the completion of data extraction, the two researchers shared their final tables and any disagreement between the judgments of the two was resolved by consulting and discussing with the third author. The Newcastle-Ottawa scale (NOS) was used to evaluate all the included articles [20], and the results were listed in Tables 1 & 2 & 3.

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**Table 1.** The demographic data of the studies included in this meta-analysis showing the prevalence of dysphagia in COVID-19 patients at admission (day 0)

Study	Country	year	Sample Size	Mean±SD	age (y)	Sex (male)	Method	Dysphagic (Total)
Redd et al. [21]	United States	2020	318					1
Martin-Martinez et al. [22]	Spain	2021	205	69.3 (17.5)	98		Subj/ EAT-10	106
Cerutia et al. [23]	Switzerland	2021	31	61 (12)	25		Subj/ GUSS	17
Ceriana et al. [24]	Italy	2021	89	61.9 ±11.3	63			25
Total			643			186		149

**Abbreviations:** SD: Standard Deviation; Subj: Subjective; EAT-10: Eating Assessment Tool-10; GUSS: Gugging Swallowing Screen

### Statistical analysis

The meta-analysis was performed to estimate the pooled prevalence of dysphagia in COVID-19 patients. The effect sizes were expressed as prevalence and also frequency at 95% confidence interval. Random effects were used for statistical analysis.

**Table 2.** The demographic data of the studies included in this meta-analysis showing the prevalence of dysphagia in COVID-19 patients at discharge

Study	Country	year	Sample Size	Mean±SD	age (y)	Sex (male)	Method	Dysphagic (Total)
Archer et al. [13]	United Kingdom	2021	99	56.8(16.7)			Subj/ FOIS	29
Ceruti et al. [16]	Switzerland	2021	31	61 (12)	25		Subj/ GUSS	7
Lima et al. [5]	Brazil	2021	101	53.4(15.9)	66		Subj/ ASHA NOMS	30
Mallart et al. [25]	France	2022	43	62.9(10.9)	30			10
Martin-Martinez et al. [22]	Spain	2021	183				Subj/ EAT-10	82
Ramos et al. [26]	Spain	2021	936	63.7 ± 15.3	558		Subj/ EAT-10	242
Regan et al. [27]	Ireland	2021	95	62	69		Subj/ FOIS	26

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Regan et al. [28]	Ireland	2021	315	76	194	Subj/ FOIS	142
Reyes-Torres et al. [29]	Mexico	2021	112	54 (12)	92	Subj/ V-VST	46
Gonzalez Lindh et al. [30]	Sweden	2021	28	61 (11.9)	22	Subj/ FOIS	10
Hoyois et al. [31]	Belgium	2021	15	60	10		9
Daunter et al. [32]	United States	2021	239	66.80 (15.31)	166		29
Ceriana et al. [24]	Italy	2021	89	61.9 ±11.3	63		6
Total			2286		1295		668

**Abbreviations:** SD: Standard Deviation; Subj: Subjective; FOIS: Functional Oral Intake Status; GUSS: Gugging Swallowing Screen; ASHA NOMS: American Speech-Language-Hearing Association National Outcome Measurement System; EAT-10: Eating Assessment Tool-10; V-VST: Volume-Viscosity Swallow Test

**Table 3.** The demographic data of the studies included in this meta-analysis showing the prevalence of dysphagia in COVID-19 patients at 3-6 months post-discharge / positive SARS-CoV-2 test

Study	Country	Year	Sample Size	Mean ±SD	Age	Sex (male)	Method	Dysphagic
Ramos et al. [26]	Spain	2021	62				Subj/ EAT-10	3
Martin-Martinez et al. [22]	Spain	2021	175				Subj/ EAT-10	42
Martin-Martinez et al. [22]	Spain	2021	171				Subj/ EAT-10	40
Neevel et al. [33]	United States	2021	24	50		12		6
Allisan-Arrighi et al. [34]	United States	2022	81	54.23(17.36)		49		16
Wahlgren et al. [35]	Sweden	2021	158	57.4(13.8)		97		13
Huang et al. [36]	China	2021	1655	57		897		69
Leis-Cofiño et al. [37]	Spain	2021	79	64		48	Subj/ EAT-10	7
Total			2405			1103		196

**Abbreviations:** SD: Standard Deviation; Subj: Subjective; EAT-10: Eating Assessment Tool-10

## Results

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## RESEARCH SELECTION

The present search found 2736 records, of which 2132 were duplicates. The authors reviewed the abstract of 604 articles. Out of which, 42 studies met the inclusion conditions for full-text review. Finally, 19 articles entered the meta-analysis stage (Fig. 1). In detail, four studies investigated the prevalence of dysphagia at admission [6, 16, 21, 24], 13 studies focused on the prevalence of dysphagia at discharge [4-6, 8, 13, 14, 16, 24, 31, 32, 38-40], and the prevalence of dysphagia in the long-term was investigated in eight studies [6, 33-37, 39]. In the studies that introduced dysphagia assessment tools, all studies used subjective tools to screen for swallowing disorders (Tables 1 & 2 & 3).

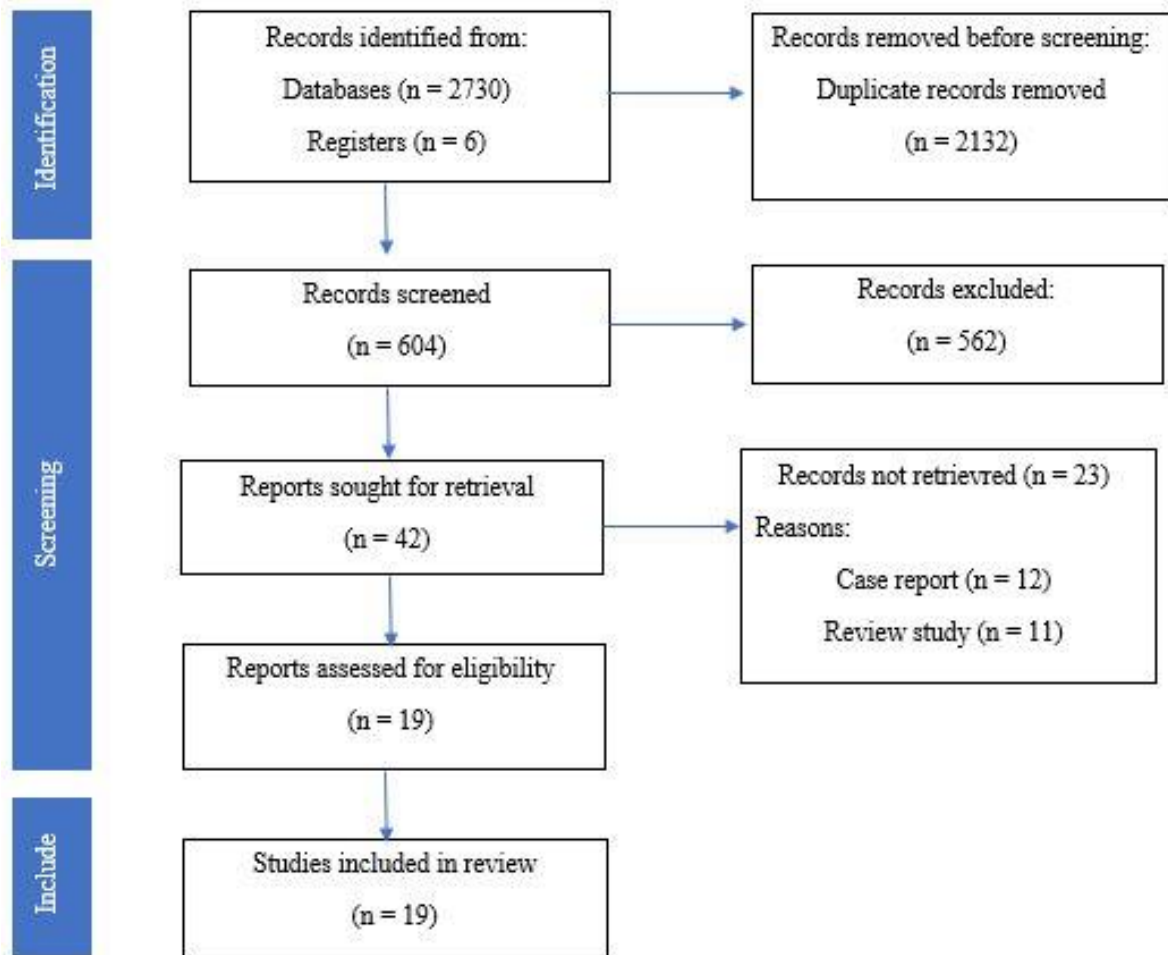
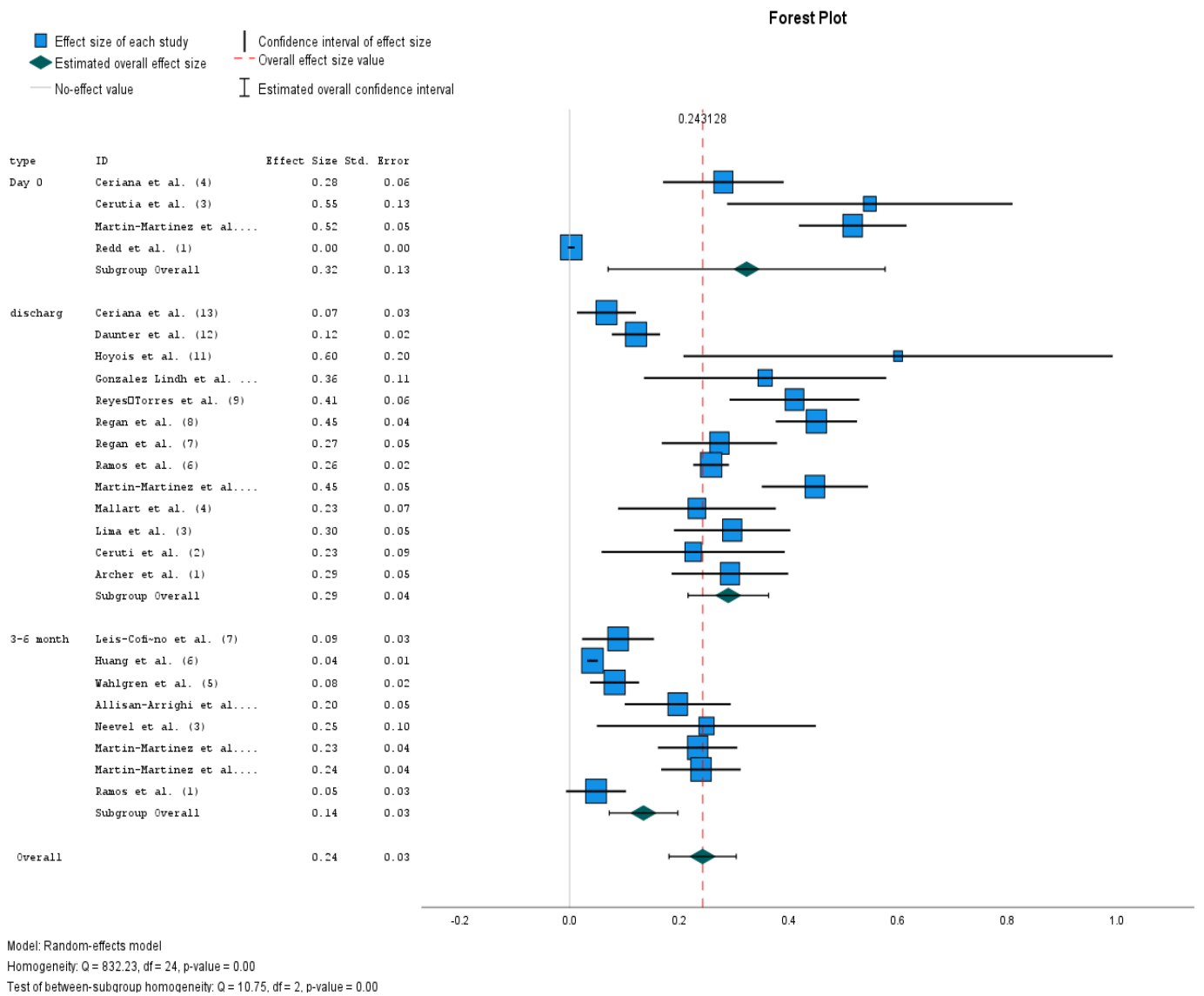


Fig. 1 The PRISMA flowchart (2020) for the selection of the eligible studies for meta-analysis

## Meta-analysis results

The study of the clinical data included 19 studies with a total of 643 COVID-19 patients at admission, 2286 COVID-19 patients at discharge, 2405 COVID-19 patients at 3-6 months post-discharge or after their positive SARS-CoV-2 test result, and 5334 COVID-19 patients in total. The demographic information of the studies included in this meta-analysis is shown in Tables 1 & 2 & 3. Forest plot of the prevalence of dysphagia in COVID-19 patients at admission, discharge, and long-term is shown in Fig. 2. As the results of the meta-analysis show, the highest prevalence of dysphagia in COVID-19 patients was related to admission with 32%, and the lowest prevalence of dysphagia in COVID-19 patients was related to 3-6 months later with 14% prevalence. Based on the meta-analysis results, in total, the average age of these patients was 61.2 years. The average age of patients was different at the time points. In detail, the mean age of patients at the time of admission, discharge, and 3-6 months post-discharge was 66.5 years, 64.28 years, and 57.11 years, respectively.

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**Fig. 2** Prevalence of dysphagia in COVID-19 patients at admission (day 0), discharge, and long-term

## Publication bias detection

The funnel plot based on the total studies is given in Fig. 3. The results show that the studies are asymmetric.

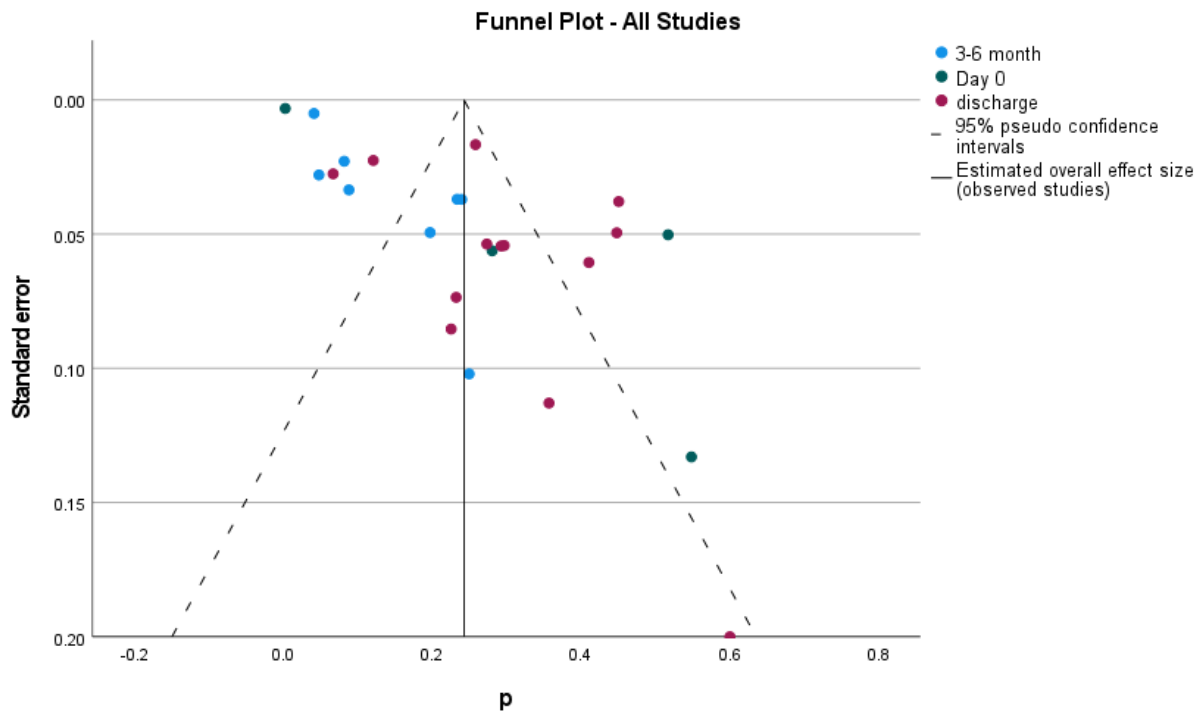


Fig. 3 Funnel plot of all studies

**DISCUSSION**

Based on the results of the present meta-analysis, the prevalence of dysphagia in COVID-19 patients at admission to the hospital is 32%. So, about one-third of COVID-19 patients may experience dysphagia as the only symptom. Ceriana et al. also reported a similar rate (28%) [24]. Although, a considerable rate of dysphagia has been noted in two recent European studies, with Martinez et al. reporting 51.7% of COVID-19 patients admitted to the ward and Cerutia et al. reporting 54.8% in COVID-19 patients admitted to the ICU [6, 16]. According to the results of the present study, dysphagia prevalence in patients diagnosed with COVID-19 at the time of discharge is very similar to the time of admission and equal to 29%. Similar studies by Archer et al. and Lima et al. reported similar percentages, 29.2%, and 29.7%, respectively [5, 13]. Although a higher dysphagia rate at these patients' time of discharge has also been reported: 45% by Regan et al. and 50% by Reyes-Torres et al. [4, 40]. Since the rate of dysphagia is almost the same at the time of admission and discharge, it can be argued that swallowing therapy for these patients during their hospitalization has not been attended to as much as necessary. Because Regan et al. showed that if these patients undergo swallowing therapy, the results will be notable; They reported after treatment implementation in hospitalized patients the prevalence of dysphagia decreased from 86% to 27% at the time of discharge [8]. However, In a study conducted by Cerutia et al. comparing the prevalence of dysphagia between COVID-19 patients and Non-COVID-19 patients, a higher rate of dysphagia was observed in COVID-19 patients with faster recovery [16]. Concerns regarding the transmission of the virus via aerosol-generating procedures in addition to the lack of instrumental assessments might have resulted in the altered amount and varied forms of management provided during pandemic waves. Other influencing issues may include SLP services in ICU settings, dysphagia training, and access to personal protective equipment [8].

Many organs in the body in addition to the lungs can be impacted by COVID-19 and this damage increases the danger of long-term health complications [7]. In the present study, the authors illustrated the prevalence of dysphagia in patients diagnosed with COVID-19 in the long term. However, the prevalence (14%) in the analysis was small, it was not negligible and it required therapeutic intervention; Because a study conducted by Martin-Martinez et al. demonstrated that dysphagia is relevant to increased 6-month mortality [6]. According to Neevel et al.'s study, this prevalence goes up to 25% [33]. The form of pneumonia caused by COVID-19 can result in long-term injury to the lungs' air sacs. And the long-term breathing difficulties caused by the scar tissue can lead to weak coordination of swallowing and breathing predisposing [7]. Furthermore, risks for developing swallowing impairments can also occur due to other injuries caused by COVID-19. As Aoyagi et al. described the COVID-19 infection may cause damage to the X and IX cranial nerves [41]. Post-acute COVID-19 Swallowing disorder is probably caused by a multiplicity of reasons [7]. However, this rate of dysphagia has been halved since hospital discharge. As found in studies, the prevalence of dysphagia is directly related to the severity of the disease [38] and intubation [4]. Therefore, after the discharge and recovery from COVID-19 and reducing the burden of the disease, the rate of dysphagia decreased. Also, by reducing the injuries caused by intubation, the rate of dysphagia is expected to decline. Another potential reason for this reduction is post-discharge rehabilitation service delivery in the community [35].

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As we have shown, the average age is the highest at the time of admission and decreases at the time of discharge and follow-up. The decrease in the average age after discharge may be due to the death of very old patients after discharge from the hospital [6]. Perhaps older patients did not cooperate for re-testing of dysphagia after discharge and did not return for re-evaluation (due to old age, comorbidities, or long-term complications of COVID-19) [6] and most of the younger patients have cooperated and returned for re-examination. Another reason for this could be the small and limited number of studies that have included the average age for day 0 [6, 16, 21].

In total, 24% of patients affected with COVID-19 suffer from dysphagia, which is a significant frequency. Data on swallowing difficulties in these patients would inform inpatient and outpatient service delivery [4, 8]. The present data indicate that SLPs should be included both in hospitals and outpatient multidisciplinary COVID-19 clinics in society [8]. Early evaluation of suspected subjects is required for timely intervention to avoid further consequences [4].

### CONCLUSION

About a quarter of patients with COVID-19 may have dysphagia (swallowing difficulties) during the acute phase and/or also in the post-acute phase of the disease. Therefore, one should be aware of the symptoms of dysphagia and treat it in time. Hospitals, multidisciplinary clinics, and SLPs will always play a vital role in evaluating, diagnosing, and treating people with COVID-19-related swallowing disorders.

### Compliance with Ethical Standards

#### Conflict of interest

The authors declared no conflict of interest.

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