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Incidence of constipation in stroke patients

A systematic review and meta-analysis

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Abstract

There is growing awareness of a link between the gut and cardiovascular disease. Constipation is common among individuals who have had a stroke, and it negatively affects social functioning and quality of life. However, no systematic study on the incidence of constipation in stroke patients has been reported.

We selected studies included in Medline, Embase, Cochrane database, and Web of Science. Studies were included if they reported the incidence in stroke patients. Two authors selected the studies, extracted the data independently, and assessed these. Subgroup analyses were conducted according to the stroke subtype and stage of stroke.

After detailed evaluations, 8 studies (n = 1385 participants) were found that contained data that were suitable for meta-analytic synthesis. A forest plot showed that the incidence of constipation was 48% (95% confidence interval [CI] = 33%–63%). In the analysis of the type of stroke subgroup, the incidence of constipation in patients who had had a hemorrhagic stroke (66% [95% CI = 40–91%]) was higher than that in patients who had experienced an ischemic stroke (51% [95% CI = 27%–75%]). The incidence in the acute stage (45% [95% CI = 36%–54%]) was lower than that in the rehabilitation stage (48% [95% CI = 23%–73%]).

Constipation after a stroke event occurs frequently. This finding may raise awareness about bowel complications to allow correct evaluation and proper management.

Abbreviations: CI = confidence interval, HS = hemorrhagic stroke, IS = ischemic stroke, NA = information not provided.

Keywords: constipation, incidence, meta-analysis, stroke, systematic review

1. Introduction

Stroke is a leading cause of death and disability worldwide, representing an important public health burden with an associated heavy economic burden for healthcare systems.[1] Report reveals that there were 33 million stroke survivors and 5.9 million stroke-related deaths in 2010.[2] Stroke produces a wide range of neurological impairments, including problems of balance, movement, speech, swallowing, urination, and defecation, all of which contribute to global public health concerns.[3]

Constipation is a common symptom among patients with central nervous system diseases, including stroke,[4] and it can lead to increased morbidity and mortality. This complication is a major cause of death in the acute and subacute stroke phases and can persist in survivors many years after the events.[5–7] Currently, constipation receives substantially less attention, but this non-neurological bowel complication following a stroke is associated with increased length of hospital stay, poor neurological outcome, the development of further complications, and even death.[4]

There is growing awareness of a link between the gut and cardiovascular disease.[8–10] Brain injuries, particularly stroke, have been well established as a cause of gastrointestinal disorders. The mechanism of gastrointestinal disorders in neurological disease is multifactorial. The brain–gut axis relates primarily with the association between neurology and the gastrointestinal system.[11,12] It is the complicated neuroendocrine network including central nervous system, enteric nervous system, and autonomic nervous system, which could maintain brain–gut interactions and the communications for information of each system.

Although constipation is a common symptom among patients with central nervous system diseases and it negatively affects social functioning and quality of life, the presence and incidence of constipation in patients with stroke remain poorly investigated.[13,14] No systematic study on the incidence of constipation in stroke patients has been reported thus far.

In this paper, we present the first systematic review and meta-analysis of the incidence of constipation after a stroke and highlight the bowel dysfunction of strokes.

2. Methods

2.1. Search strategy

We selected observational studies published between January 1980 and October 2016. Ethical approval and informed patient

Editor: Bappaditya Ray.

Funding: This work was supported by the Natural Science Foundation of Jiangsu Province (BK20151570); the Key Project of Medical Science and Technology Development of Nanjing City (ZKX15038); and the Research Innovation Program of Academic Degree Postgraduates in Universities of Jiangsu Province (KYLX16–1146).

The authors have no conflicts of interest to disclose.

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Medicine (2017) 96:25(e7225)

Received: 24 February 2017 / Received in final form: 24 May 2017 / Accepted: 30 May 2017

http://dx.doi.org/10.1097/MD.0000000000007225

consent were not required as the study is a systematic review and meta-analysis. Relevant literature was identified as follows: pertinent articles in the following electronic databases: Medline, Embase, Cochrane database, and Web of Science; electronic search terms that included stroke, cerebrovascular accident/disorder, intracerebral/cerebral hemorrhage, ischemic stroke (IS), cerebral/brain infarction, brain ischemia, bowel dysfunction/disorder, and constipation; the abstract of each article was carefully reviewed to detect appropriated publication; full-text articles were retrieved and read carefully, including all reference lists of all relevant articles to identify additional eligible publications; and references from previously retrieved articles and all eligible studies were also searched manually.

2.2. Study selection

The source of selection and measurement bias were considered in the inclusion and exclusion of studies in terms of study design, context, and participants.

Studies were included if they reported the incidence of constipation in stroke patients. Inclusion criteria were: prospective studies, retrospective cohort studies, or cross-sectional studies; original research in adult human stroke survivors; studies that recruited stroke and nonstroke participants were included if separate stroke data were provided; the incidence of constipation was reported in the study; the study population had episodes of total stroke, IS, or hemorrhagic stroke (HS); and constipation was defined based on the symptoms adapted from the Rome II/III criteria. The study selection process is depicted diagrammatically in Fig. 1.

We excluded the following articles: patients with a prior history of constipation before the stroke diagnosis; patients suffered from gastrointestinal tract disorders or gastrointestinal surgery in the past; the unclear definition of constipation; nonadult population; highly selected studies or treatment studies without incidence data; commentaries, single case reports, editorials, and reviews; and non-English articles or articles without full text available.

2.3. Data extraction and quality assessment

The following general descriptive information was extracted from each study: first author and year of publication; number, age, gender, and location of patients; subtype of stroke; and various stages following a stroke.

Two authors (JXL and MGY) selected the studies to be included in the review by reading each article carefully, extracting the data independently, and cross-checking the information. Any disagreement was discussed until a consensus was reached. A reviewer (WFG) was consulted if disagreement persisted.

We assessed the quality of the studies using a method rating system suggested by the Cochrane Collaboration.[15] The rating system required each study to be assessed according to 5 domains: rationale, sample, assessment, confounding variables, and statistical analysis.[16] The data from all included studies were clearly tabulated, and deviations were taken into account and identified during the quality assessment stage.

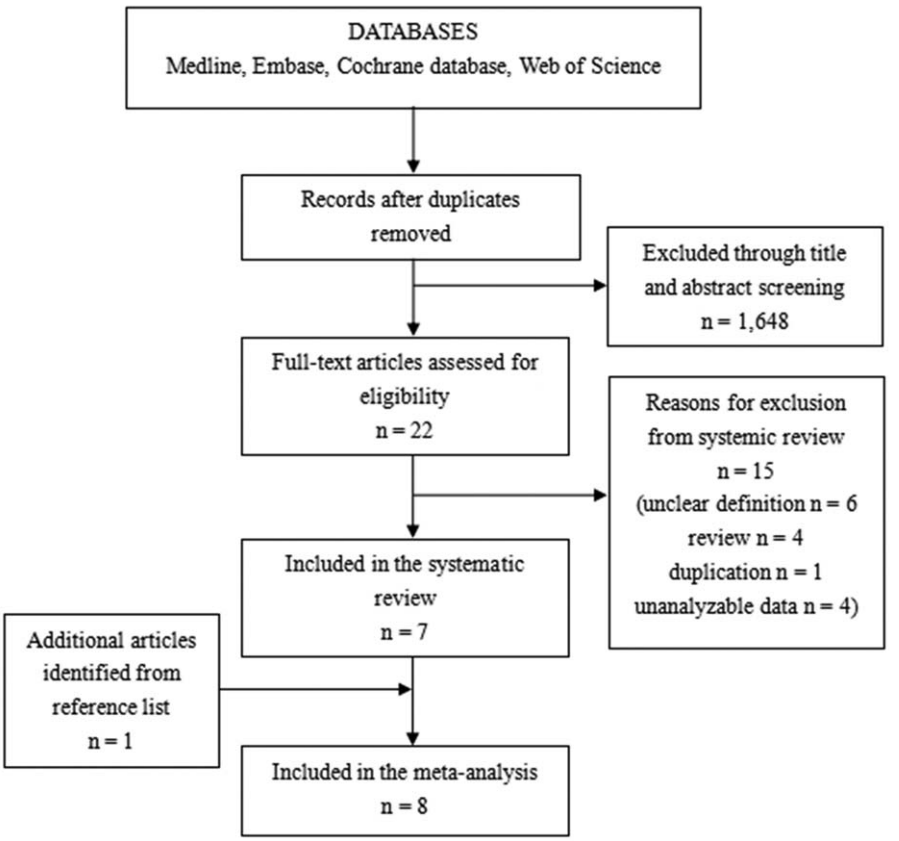

Figure 1. Flow diagram of literature search. Flow diagram of the study selection process.

Table 1

Characteristics of included studies examining the incidence of constipation in stroke patients.

Study	Year	Location	Survey data	Total samples (n) (stroke subtype)	Male/Female (n)	Age, years	Stage of stroke	Samples of constipation, %
Moon et al[17]	2015	Korea	Jan 2009–Feb 2012	59 (IS 34; HS 25)	39/20	59.59±13.91	Rehabilitation	45 (76)
Lim et al[18]	2015	Singapore	NA	55	33/22	61.2±9.7	Acute	18 (33)
Engler et al[19]	2014	Brazil	Dec 2009–May 2010	98 (IS 87)	49/49	58.13±12.64	Rehabilitation	28 (29)
Lin et al[20]	2013	Taiwan	Aug 2010–July 2011	155 (IS 124; HS 31)	94/61	60.3	Rehabilitation	123 (79) (IS 95; HS 28)
Cai et al[21]	2013	China	Dec 2010–July 2011	723 (IS 542; HS 143)	469/254	18–94		250 (35) (IS 168; HS 64)
				372			Acute	156 (42)
				351			Rehabilitation	94 (27)
Yi et al[22]	2011	Korea	Dec 2008–Oct 2009	51 (IS 37; HS 14)	29/22	63.4±13.6	Acute	25 (49) (IS 17; HS 8)
Su et al[23]	2009	China	Nov 2003–Oct 2004	154 (IS 122; HS 32)	93/61	65.61±14.53	Acute	85 (55) (IS 63; HS 22)
Bracci et al[24]	2007	Italy	NA	90	43/47	68 (27–95)	Rehabilitation	27 (30)

HS = hemorrhagic stroke, IS = ischemic stroke, NA = information not provided.

2.4. Statistical analysis

We calculated the incidence of constipation in each study. The statistical validity of aggregating the studies was assessed with I^2 for heterogeneity. Pooled incidence estimates and 95% confidence intervals were determined by the random-effect model. The meta-analysis was performed using STATA software (version 12.0; Stata Corp LP, College Station, TX).

Subgroup analyses were conducted using stroke subtype (IS or HS) and stage of stroke (acute stage or rehabilitation stage). Sensitivity analyses were performed to evaluate whether the results could have been affected markedly by a single study by removing them one by one from the meta-analysis.

3. Results

Figure 1 summarizes the process of identifying eligible epidemiological studies. The literature search yielded 1670 papers, and 1648 were ultimately excluded after screening the title and abstract. After duplicate studies and studies that did not meet the inclusion criteria were excluded, 7 eligible studies were selected and an additional 1 study was identified from reference lists. After detailed evaluations, 8 studies[17–24] were included for the final meta-analysis.

3.1. Study characteristics

There were 8 studies remaining after the quality assessment. Table 1 shows the characteristics of the studies, including the first author, publication year, survey location, survey data, sample size, age, gender, and stage of stroke.

A total stroke population of 1385 people was investigated, with 601 patients having suffered constipation. The study samples ranged from 51[22] to 723[21] patients. With regard to survey location, 6 studies[17,18,20–23] were conducted in Asia, 1[24] in Europe, and 1[19] in America.

Four studies[20–23] involving IS included 825 total patients, and 4 studies[20–23] involving HS included 220 patients. Four studies (632 patients)[18,21–23] were conducted in the acute stages of a stroke, and 5 studies (753 patients)[17,19–21,24] were conducted in phases of rehabilitation.

3.2. Incidence of constipation and subgroup analysis

The incidence of constipation varied greatly, ranging from 29%[19] to 79%.[20] The forest plot in Fig. 2 shows that incidence of constipation in stroke patients was 48% (95% confidence interval [CI] = 33%–63%).

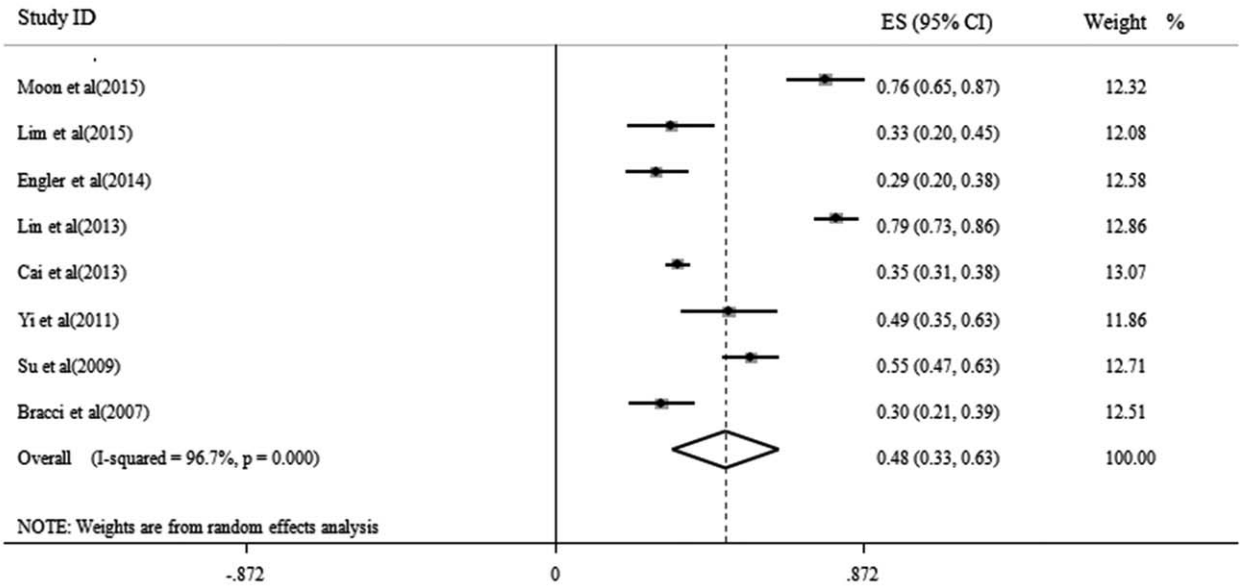

Figure 2. Incidence of constipation in stroke patients. The forest plot of incidence of constipation in stroke patients.

In analyzing subgroups, the incidence of constipation in IS patients ranged from 31%[21] to 77%[20] and 45%[21] to 90%[20] in HS patients. The incidence of constipation after a HS was 66% (95% CI=40%–91%), higher than with an IS event (51% [95% CI=27%–75%]) (Fig. 3).

Figure 4 shows the incidence of constipation in different stages of a stroke. In the acute stage, the incidence of constipation ranged from 33%[18] to 55%,[23] and in the rehabilitation stage, it ranged from 27%[21] to 79%.[20] The forest plot shows that the incidence of constipation is 45% (95% CI=36%–54%) in the acute stage and 48% (95% CI=23%–73%) in the rehabilitation stage. Study characteristics, incidence of constipation, and subgroup analyses are shown in Table 2.

4. Discussion

The objective of this review was to assess the incident of constipation in adult stroke patients. There were 8 studies[17–24] meeting the inclusion criteria for this review, and the results showed that the total incident of constipation was 48% (95% CI=33%–63%).

Constipation is common after a stroke, with incidents between 29%[19] and 79%,[20] but this complication has received much less attention in poststroke patients.[25] Experiencing a stroke, which can affect several aspects of personal life, contributes to increased risk factors of constipation. Several mechanisms for these associations could be considered. First, stroke patients typically reduce their physical mobility, fluid intake, and fiber intake because they may have difficulty swallowing. Second, dependence on others to use the toilet may lead to constipation. Third, the use of medications that can affect bowel function, dehydrating agents, for example, may prevent the gut from absorbing water.[19]

However, cerebral injury can lead to an interruption of the axis between the central nervous and gastrointestinal systems, which could cause constipation. The most important reason may lie in the dysfunction of brain–gut axis. Alterations in the brain–gut axis of stroke patients include peripheral factors, central and

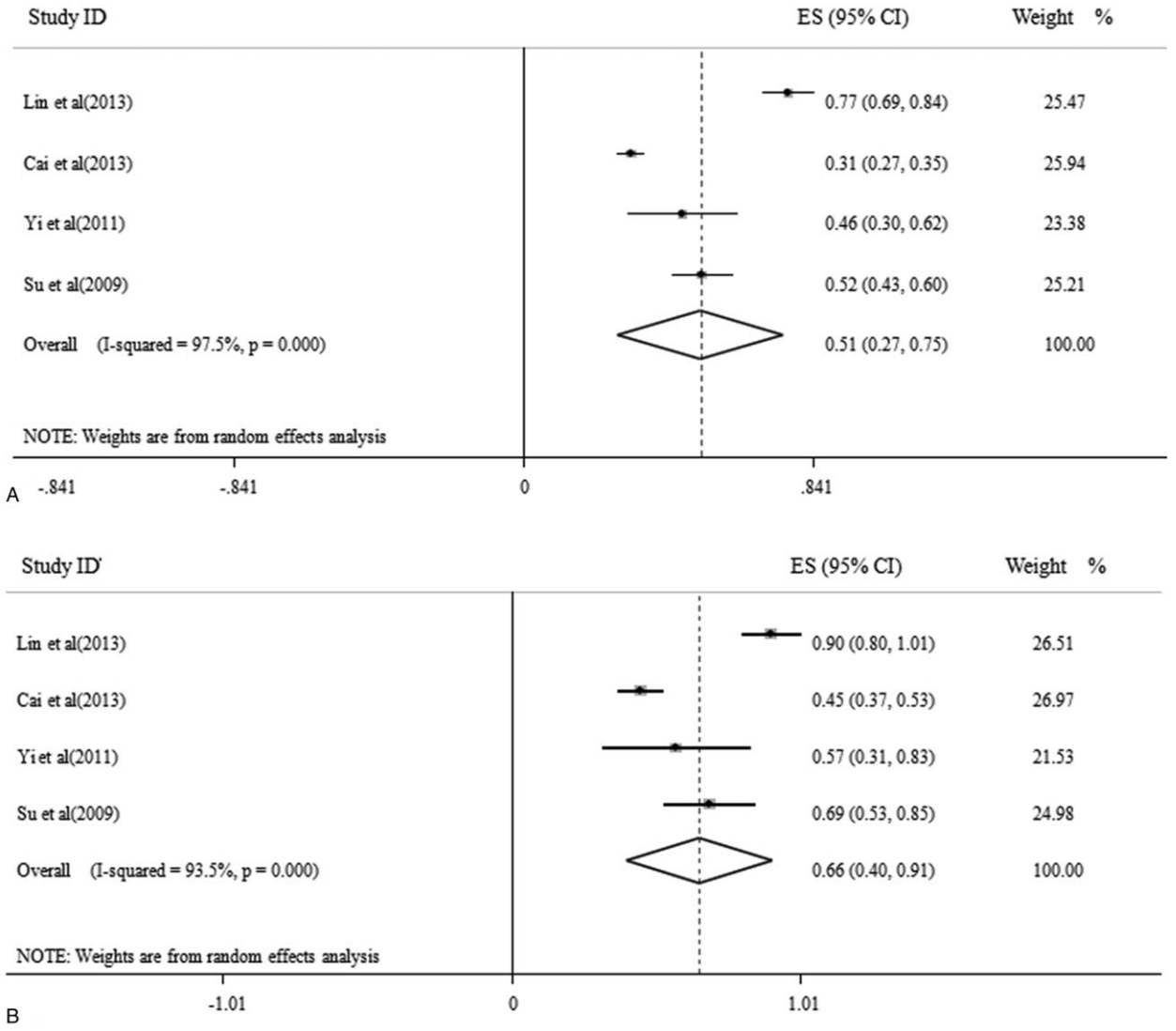

Figure 3. Incidence of constipation in the stroke subtype. The forest plots of incidence of constipation in the stroke subtype. (A) The forest plot of incidence of constipation in ischemic stroke patients. (B) The forest plot of incidence of constipation in hemorrhagic stroke patients.

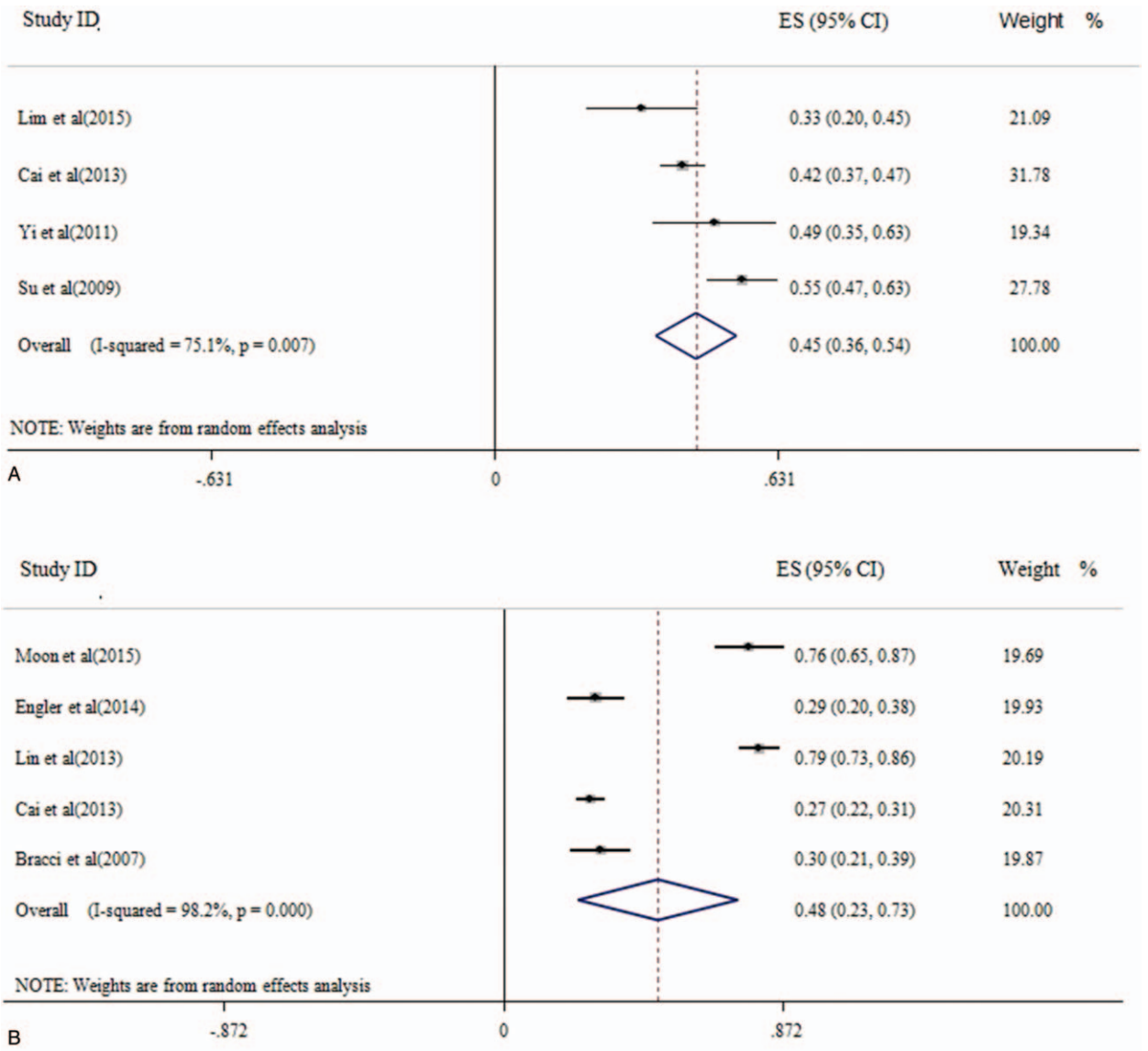

Figure 4. Incidence of constipation in different stage of stroke. The forest plots of incidence of constipation in different stage of stroke. (A) The forest plot of incidence of constipation in acute stage of stroke. (B) The forest plot of incidence of constipation in rehabilitation stage of stroke.

autonomic neural functions, hormones, and amines. Bowel function is controlled by the enteric nervous system, the autonomous nervous system, the voluntary nervous system, certain hormones, and luminal contents.[13] Thus, constipation can be affected by lesions of the central and peripheral nervous systems. After a stroke, lesions in the cerebral cortex, basal ganglia, brain stem, cerebellum, and lower cranial nerves may result in constipation. Cerebral palsy affects the entire gastrointestinal tract, causing clinically significant symptoms.[19] Disordered gastrointestinal emptying and abnormal bowel motility result in constipation. Poststroke immunodepression affects the intestinal mucosa, possibly affecting its barrier function. These

Table 2

Subgroup analysis of constipation with stroke patients.

Subgroup	No. of reports	No. of participants	No. of cases	Range	Prevalence (95% CI)
Stroke subtype					
IS	4	825	343	31–77%	51 (27–75)
HS	4	220	122	45–90%	66 (40–91)
Stage of stroke					
Acute stage	4	632	282	33–55%	45 (36–54)
Rehabilitation stage	5	753	317	27–79%	48 (23–73)

CI = confidence interval, HS = hemorrhagic stroke, IS = ischemic stroke.

changes could lead to increased bacterial translocation. Furthermore, intestinal dysbacteriosis results in bowel dysfunction.[26]

In regards to the subgroup analysis, the incidence of constipation in HS patients (66%) was higher than that in patients who had had an IS (51%). Acute cerebral hemorrhage is the severest type of cerebral apoplexy. After the occurrence of cerebral hemorrhage, the mechanism of hematoma surrounding tissue of secondary injury are multifaceted, including brain edema around the hematoma which is focused on being to prove the important causes in the course of disease. These factors lead to the damage of central nervous system, autonomic nervous system dysfunction, gastrointestinal peristalsis inhibition, and secretion decrease. Meanwhile, hematoma and brain edema may affect the brain–gut axis neural pathway through altering midline structure of brain. It is clear that cerebral hemorrhage and cerebral infarction have different pathological mechanism of brain damage and therapeutic method. The majority of cerebral hemorrhage patients need dehydration treatment, and intestinal constipation is caused by lack of water.

This review showed that the incidence of constipation in the acute stage of a stroke event (45%) was lower than that in the rehabilitation stages (48%). Compared to the incidence of constipation during acute stages, stroke patients in the rehabilitation phase demonstrated a slightly higher risk for constipation. It appears that it is different in the acute and rehabilitation stages.[27] Although constipation would disappear gradually with the time after the attacks, many stroke patients have complete functional independence 6 months after an acute stroke. On the other hand, with the progression of stroke, patients condition may worsen, and consequently, a variety of complications, including intestinal complications, begin to emerge.

Several limitations of this meta-analysis should be considered. First, despite the high incidence of constipation in the stroke patient population, a lack of coordinated, high-quality studies remain. Second, the differences among studies included in this review show that the exact incidence is unclear and raises the question of whether the differences are related to the size of the study group, the phase of health care, or the time point at which patients were included and assessed. Third, there are many factors responsible for constipation, such as decreased activity level, altered dietary habits, inappropriate water or nutritional intake, depression, use of various drugs, and other factors.[28] Research baseline is difficult to reach homogeneity. Moreover, there is only 1 study[23] referring to the relationship between constipation and stroke outcome. It is unclear whether constipation has any effect on stroke prognosis.

In conclusion, we report the incidence of constipation in stroke patients using a systematic review and meta-analysis for the first time. The data suggested that constipation are very common after a stroke and contribute to decreased quality of life, limitation of social activities, and adverse outcomes, including disability, poor neurological function, and even death. It is important to have an appropriate evaluation to properly manage constipation. These findings will help clinicians to understand the effects on bowel complications in stroke patients.

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