



Review

Acupuncture for senile insomnia: A systematic review of acupuncture point

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HIGHLIGHTS

- Insomnia is highly prevalent in the elderly.
- Acupuncture is an effective treatment for insomnia in the elderly.
- Shenmen, Sanyinjiao, and Baihui are the key acupoints of acupuncture for senile insomnia.

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Or sleep delay

ABSTRACT

Objective: Insomnia is one of the most common diseases among the elderly. The elderly with long-term insomnia are more likely to have symptoms such as vertigo, fatigue, and immunity decline. Acupuncture is increasingly being used to treat insomnia. The purpose of this review is to summarize the critical acupoints in the treatment of senile insomnia and evaluate the effectiveness of the treatment. To provide a research basis for acupuncture treatment of senile insomnia in the future.

Methods: We will search the clinical studies on acupuncture in the treatment of senile insomnia published by CNKI (China National Knowledge Infrastructure), Wanfang (Wan Fang Data Knowledge Service Platform), CSTJ (China Science and Technology Journal Database), Pubmed, and ScienceDirect before December 31, 2023. Acupoint will be analyzed using TCMISS (TCM Inheritance Assistance Platform).

Results: 265 literatures were retrieved, and 94 were selected as the criteria. The results showed that there were 90 acupoints related to treatment. The acupoints with the highest frequency were shenmen (HT7), sanyinjiao (SP6), baihui (GV20), zusanli (ST36), neiguan (PC6), xinshu (BL15), taixi (KI3), and sishencong (EX-HN1) anmian (JLSXX-QX), shenshu (BL23). The most frequently used meridians were bladder meridian (BL), governor vessel (GV), and stomach meridian (ST). They were mainly distributed in the lower limbs and head. The most frequent specific points are the five transport points and source points. The most frequently used combinations are “shenmen (HT7) - sanyinjiao (SP6)”, “shenmen (HT7) - baihui (GV20)”, and “shenmen (HT7) - neiguan (PC6)”. Association rule analysis showed that the acupoints with the highest confidence were shenmen (HT7), neiguan (PC6), and sanyinjiao (SP6). Network topology analysis showed that sanyinjiao (SP6), zusanli (ST36), and shenmen (HT7) were the core acupuncture points for the treatment of senile insomnia.

Conclusion: The primary Acupuncture acupoints for senile insomnia are shenmen (HT7), sanyinjiao (SP6), baihui (GV20), zusanli (ST36), and neiguan (PC6), indicating that these acupoints have a strong correlation with senile insomnia. Sanyinjiao (SP6), zusanli (ST36), and shenmen (HT7) may be the core acupuncture acupoints for the treatment of senile insomnia.

1. Introduction

Insomnia is a common human disease that can be classified as primary or secondary based on its etiology Drake et al. (2003); Monti (2004); Morin et al. (2015); Roth (2007); Stepanski and Rybarczyk

(2006). The prevalence rate and incidence rate increase with age, which is one of the most common diseases of the elderly at present (Ferrucci et al., 2008); Gooneratne and Vitiello (2014); Ren et al. (2020). With the substantial improvement of global medical and health standards, the population's life expectancy has been extended, the fertility rate has

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decreased, and the aging of the population has increased [Linda et al. \(2018\)](#). Insomnia has become a common disease among old people ([Dhaval et al., 2018](#)). The main clinical manifestations of insomnia are insufficient sleep time, shallow sleep degree, irritability, and anger [Summers et al. \(2006\)](#). Studies have shown that 50 % of the elderly have difficulty falling asleep or staying asleep. The main reason is that aging leads to the degeneration of the central nervous system, leading to sleep rhythm disorders [Bliwise et al. \(1992\)](#). Insomnia is easy to sudden death, heart disease, hypertension, senile dementia, and cerebral hemorrhage, and will also increase the incidence rate of many common chronic diseases [Baek et al. \(2021\)](#); [Khachatryan \(2021\)](#); [Mukku et al. \(2018\)](#); [Phillips and Mannino \(2007\)](#). This undoubtedly affects the quality of life and physical and mental health of the elderly and increases the economic burden on the entire family and society [Gabriel and Bowling, \(2004\)](#); [Laugsand et al. \(2014\)](#). Aging is one of the main reasons for insomnia incidence [Cohen et al. \(2022\)](#). Physical exercise, such as dancing and swimming, is used internationally ([Garcia et al., 2017](#); [Oliveira et al., 2019](#)) to delay aging. However, for elderly patients with pre-existing insomnia, cognitive behavioral therapy and pharmacotherapy are the main treatments. Benzodiazepines and non-benzodiazepines are widely used to treat insomnia [Holbrook et al. \(2000\)](#); [Riemann and Perlis \(2009\)](#); [Sivertsen et al. \(2006\)](#); [Soyka et al. \(2023\)](#). Although effective drug treatment methods exist, long-term use can lead to tolerance, dependence, and withdrawal reactions [Jacob et al. \(2012\)](#); [Michellini et al. \(1996\)](#); [Sch?pf \(1983\)](#); [Vinkers and Olivier \(2012\)](#). Serious adverse effects limit the clinical application and long-term use of the drug therapy. Therefore, there is an urgent need for a safer and more effective method to relieve insomnia. Treatment of insomnia with multiple medications leads to adverse effects and limited improvement in symptoms. Complementary, alternative, and integrative medicine providers should seek treatment options focusing on treating the underlying cause, not just the symptoms.

Acupuncture has aided the treatment of insomnia in the safest and most popular method [Akerele \(1991\)](#); [Shah et al. \(2008\)](#); [Zhao \(2013\)](#). Hammes E A et al. confirmed the effectiveness of acupuncture in improving the quality of life of patients with insomnia, providing a new option for patients who are reluctant to be treated with harmful medications, and reducing the potential risks of drug use [Hammes et al. \(2014\)](#). The clinical effects of acupuncture in the treatment of insomnia are significant, including prolonged sleep duration, improved sleep efficiency, improved anxiety symptoms, relief of headaches, and reduced medication intake [Huang et al. \(2011\)](#). In combination therapy, acupuncture combined with an auricular needle produced a certain hypnotic effect, which was stable and maintained for at least 13 weeks. Acupuncture can be considered as an alternative for patients with insomnia, especially those who do not respond significantly or are unacceptable to conventional medications or psychobehavioral therapies [Chung et al. \(2018\)](#). Later, it was further found that compared with placebo acupuncture, after continuous use of benzodiazepine drugs for more than three months, electroacupuncture treatment for two weeks or 12 weeks showed a higher drug discontinuation rate. Providing robust and high-quality evidence for electroacupuncture as an adjunct method to long-term benzodiazepine dose reduction therapy [Yeung et al. \(2018\)](#). Several meta-analyses of nonpharmacological interventions for insomnia in the elderly have shown that acupressure or auricular acupuncture is more effective than controls [Samara et al. \(2020\)](#).

Regarding sleep quality, non-pharmacological therapies such as acupuncture outperformed the waiting list on the overall PSQI score. Young C K et al. confirmed that the combination of benzodiazepines and acupuncture is often more effective than monotherapy [Young et al. \(2021\)](#). Acupuncture is safer than pharmacological interventions. Weitao D provides reliable evidence for the efficacy and safety of acupuncture in the treatment of insomnia in the elderly [Weitao et al. \(2023\)](#).

In conclusion, acupuncture has certain advantages and is relatively safe for the treatment of insomnia in the elderly. However, the current

studies pay more attention to the methods of acupuncture but less to the specific details of acupuncture application or acupoint selection. So, the purpose of this study was to investigate acupuncture in the treatment of senile insomnia with the acupuncture point rule to improve the effect of the treatment of senile insomnia and quality of life.

2. Data and methods

2.1. Sources of information

The search was performed without restriction to language or year of publication. Literature on the treatment of senile insomnia by acupuncture was searched from CNKI, Wanfang, CSTJ, Pubmed, ScienceDirect, etc. The search term was “Senile insomnia, Acupuncture, Sleep disorders, or Sleep delay.” The corresponding English translation was used when searching the English database, and the search date was from the self-built database to December 31, 2023.

2.2. Inclusion criteria

- 1) The patient has a definite diagnosis of senile insomnia ([Sateia, 2014](#)), and the patient is ≥ 60 years old, regardless of gender, race, condition or intensity;
- 2) Clinical report of treating insomnia with acupuncture;
- 3) Syndrome differentiation and acupoint prescription are clear;
- 4) The types of interventions included in combination therapy, such as massage therapy, physiotherapy, and placebo, were retained.

2.3. Exclusion criteria

- 1) The literature on treatment methods mainly includes eye-acupuncture, auricular point, moxibustion, seven-star needle, warm needling therapy, knife needle or balance needle, etc.
- 2) News reports and lectures;
- 3) It is impossible to confirm and challenging to obtain the full text of the literature only through the abstract;
- 4) Endnote software was used to eliminate duplicate literature, and only 1 paper was used for data extraction.

2.4. Literature screening

The searched literature is independently screened according to inclusion and exclusion criteria, then the extracted data is cross-checked, and disagreements are resolved through internal discussion. Read the title and abstract first, then read the full text further to determine if it can be included in the study. The names of acupoints were normalized according to “Nomenclature and location of meridian points.”

2.5. Data processing

The selected data was used to establish an acupoint prescription database and imported into the TCM Inheritance Assistance Platform (TCMISS) for descriptive analysis and association rule analysis.

2.6. Management of lost data

When critical data is missing, contact the corresponding author by email or phone.

3. Results and discussion

3.1. Literature search results

There are 265 related literature were retrieved, including 195 CNKI, 39 Wanfang, 31 CSTJ, and 0 Pubmed and ScienceDirect. According to the screening requirements,

Table 1
Frequency of acupoints.

Acupoint	Frequency	Acupoint	Frequency	Acupoint	Frequency
HT7	68	LR3	29	CV12	13
SP6	62	BL20	27	CV4	12
GV20	54	KI6	27	GV24	12
ST36	44	GV24+	20	LR2	12
PC6	43	BL62	19	LI4	10
BL15	40	BL18	18	ST44	7
KI3	39	PC7	16	KI1	7
JLSXX-QX	39	ST40	15	CV6	7
EX-HN1	38	BL19	14	SP10	6
BL23	30	GB20	14	GB43	6

3.2. Statistical analysis of frequency of acupoints

The 94 literatures' frequency statistics met the criteria using TCMISS. The total number of acupoints included was 879 times, and the number was 90, sorted by frequency of occurrence. Due to the excessive number of acupoints, this study only shows acupoints with a frequency of more than 30 times, as shown in Table 1. The top 10 acupoints are shenmen (HT7), sanyinjiao (SP6), baihui (GV20), zusanli (ST36),

neiguan (PC6), xinshu (BL15), taixi (KI3), sishencong (EX-HN1) anmian (JLSXX-QX), shenshu (BL23). As shown in Fig 1. According to the analysis of the result of point selection, shenmen (HT7), the point with the most frequent point selection, belongs to the heart meridian (HT). It is located on the wrist, at the ulnar end of the transverse stripe of the palm of the wrist, and at the radial depression of the flexor tendon of the ulnar wrist. shenmen (HT7), as the source point of the heart, moderately stimulates the central nervous system to play an anti-insomnia and sedative role. Sanyinjiao (SP6) belongs to the spleen meridian (SP), which is located on the medial leg, 3 inches above the medial malleolar tip of the foot behind the medial tibial margin, and is the crossing point of the liver, spleen, and kidney. Soothe the liver, regulate the spleen, tonify the kidney, replenish essence, and tonify and nourish heart blood. It can stimulate cognitive and emotional brain regions, such as the anterior cingulate lobe and thalamus, after sleep deprivation to promote sleep Krause et al. (2017). Baihui (GV20) and sishencong (EX-HN1) unclog local Spirit and Qi.

3.3. Statistical analysis of meridian frequency

According to the statistical results of the frequency of acupoints, the meridians are classified as fourteen meridians. The taiyang (EX-HN5),

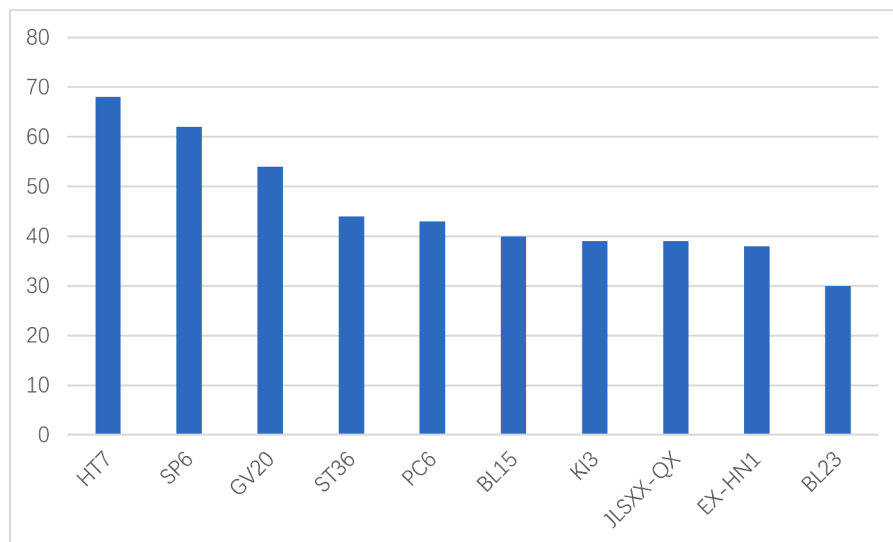


Fig. 1. Bar chart of the frequency of acupoints in the top ten.

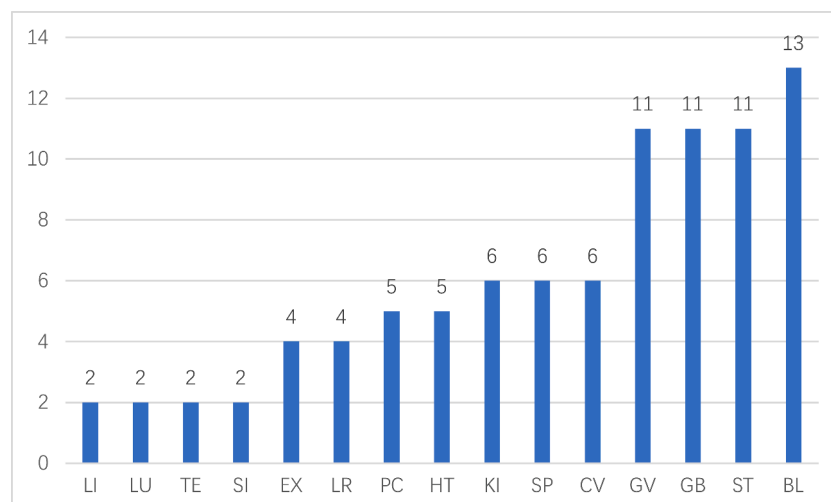


Fig. 2. Bar chart of frequency of meridian application.

Table 2
Frequency of meridian.

Meridian	Acupoint	Frequency	Meridian	Acupoint	Frequency
BL(167)	BL15	40	GB(43)	GB20	14
	BL23	30		GB43	6
	BL20	27		GB34	4
	BL62	19		GB40	4
	BL18	18		GB41	3
	BL19	14		GB15	3
	BL17	6		GB44	2
	BL21	4		GB8	2
	BL13	4		GB12	2
	BL44	2		GB39	2
	BL35	1		GB24	1
	BL10	1	ST(74)	ST36	44
	BL14	1		ST40	15
GV(92)	GV20	54		ST44	7
	GV24	12		ST27	1
	GV14	4		ST34	1
	GV9	4		ST21	1
	GV10	4	SP(79)	ST45	1
	GV11	4		ST41	1
	GV4	2		ST2	1
	GV16	3		ST25	1
	GV26	3		ST8	1
	GV13	1		SP6	62
	GV15	1		SP10	6
CV(39)	CV12	13		SP9	5
	CV4	12		SP3	2
	CV6	7		SP4	3
	CV17	3		SP1	1
	CV8	2	KI(78)	KI3	39
	CV7	2		KI6	27
EX(100)	EX-HN1	38		KI1	7
	JLSXX-QX	39		KI7	3
	GV24+	20		KI5	1
	EX-HN5	3		KI4	1
HT(75)	HT7	68	PC(63)	PC6	43
	HT6	3		PC7	16
	HT5	2		PC5	2
	HT4	1		PC8	1
LR(44)	HT9	1	SI(4)	PC4	1
	LR3	29		SI3	3
	LR2	12		SI4	1
	LR14	2	LU(4)	LU7	2
	LR8	1		LU9	2
TE(3)	TE5	2	LI(14)	LI4	10
	TE6	1		LI11	4

sishencong (EX-HN1), anmian (JLSXX-QX), and yintang (GV24+) were added to the extra acupoint. As shown in Fig 2, the meridians involved most frequently were the bladder meridian (BL) (167), governor vessel (GV) (92), and spleen meridian (SP) (79). Small intestine meridian (SI), triple energizer meridian (TE), and lung meridian (LU) no more than four times. The most frequently treated acupoints were shenmen (HT7) with heart meridian (HT) and sanyinjiao (SP6) with spleen meridian (SP), 68 times and 62 times, respectively, as shown in Table 2. On the bladder meridian (BL), two of the most commonly used acupoints are xinshu (BL15) and shenshu (BL23), which are consistent with the statistical results of the frequency analysis of acupoints. These results indicate a high frequency of bladder meridian (BL) acupoints in treating senile insomnia. Governor vessel (GV) and bladder meridian (BL) jointly control the bladder meridian (BL) back point. It can harmonize the viscera and bowel, harmonize the qi and blood, and pass Yang. The spleen meridian (SP) and kidney meridian (KI) regulate the root of innate endowment and root of acquired endowment, tonifying and nourishing heart blood and kidney essence. This is associated with the basic pathogenesis of senile insomnia. The bladder meridian (BL), governor vessel (GV), heart meridian (HT), and stomach meridian (ST) all pass through the neck, which is in line with the principle of "where the meridian passes, the main points reach." In summary, bladder meridian (BL) and governor vessel (GV) are the main methods for treating

senile insomnia and have satisfactory application value.

3.4. Statistical analysis of the acupoints distribution in human body parts

The distribution of acupoints was divided into Points of Head and Neck (EX-HN), Points of Back and Waist (EX-BW), Points of Upper Extremities (EX-UE), Points of Extremities Lower Extremities (EX-LE), and Points of Chest and Abdomen (EX-CA). The distribution patterns are analyzed in Table 3 and Fig 3. The results showed that the total number of acupoints selected was 879 times. The number of Points of Lower Extremities (EX-LE) is the highest, with 311 times, accounting for 35.4 % of the total frequency, which aligns with the principle of distal acupoint extraction. The Points of Lower Extremities (EX-LE) that were selected most frequently were sanyinjiao (SP6) (62), zusanli (ST36) (44), taixi (KI3) (39), zhaohai (KI6) (27). The Points of Head and Neck (EX-HN) were selected for the second time, accounting for 23.1 % (203 times), and 19 points were selected. The Point selection at Points of the Head and Neck (EX-HN) conforms to the principle of proximal point selection and local point selection. The Points of Head and Neck (EX-HN) with more frequently were selected as baihui (GV20) (54), anmian (JLSXX-QX) (39), sishencong (EX-HN1) (38), yintang (GV24+) (20) and fengchi (GB20) (14). The selection of points in EX-HN and EX-LE reflects the idea of both proximal and local point selection and distal point selection He et al. (2015).

The acupoints of EX-CA were selected 44 times (5 %). According to the results of the above analysis, the Points of the Lower Extremities (EX-LE) and the Head and Neck (EX-HN) were also the most frequently used points. This proves that the Lower Extremities (EX-LE) and the Head and Neck (EX-HN) are essential body parts for treating senile insomnia and have good research potential.

3.5. Frequency statistics of specific points usage

The Specific Points not only have the characteristics of general acupoints but also have special therapeutic effects. The Specific Points have more vital harmonized qi and blood effects. In clinical practice, specific point therapy is often used to treat elderly insomnia. According to the nature of Specific Points, acupoints are divided into five transport point, source point, connecting point, cleft point, transport point and alarm point, confluence points of the eight vessels, lower sea points of the six bowels, and eight meeting points.

Data analysis was performed on literature that met the standards, with a total of 74 Specific Points –918 times. Plot the frequency of use for each Specific Point as a bar graph, as shown in Fig 4. In the treatment of senile insomnia, five transport points were used most frequently (268), including 26 acupoints. The most frequent acupoints were shenmen (HT7), zusanli (ST36), taixi (KI3), taichong (LR3), daling (PC7), xingjian (LR2), hegu (LI4), yongquan (KI1) and neiting (ST44) and xiaxi (GB43), as shown in Table 4. The results showed that shenmen (HT7) had the most significant number, and shenmen (HT7) also belonged to the source point with high frequency (167). So, selecting shenmen (HT7) in the treatment of senile insomnia could achieve a very good curative effect.

3.6. Frequency statistics of acupoints combination

Among the 94 pieces of literature that met the criteria, only 3 selected a single acupoint. Acupuncture treatment is usually performed by combining multiple points. The combination analysis of multiple acupoints was carried out using the TCMIS to explore the combination relationship of acupoints. Set the support degree to 20 and confidence degree ≥ 0.8 , we have obtained 68 acupuncture acupoint combinations for treating senile insomnia. The most used combinations were "shenmen (HT7) - sanyinjiao (SP6)", "shenmen (HT7) - baihui (GV20)", and "shenmen (HT7) - neiguan (PC6)". The frequency was 53 times, 41 times, and 39 times, respectively, as shown in Table 5.

Table 3
Frequency of distribution of acupoints on human body.

Body Region	Acupoint	Frequency	Body Region	Acupoint	Frequency	Body Region	Acupoint	Frequency
EX-BW(161)	BL15	40	EX-LE(311)	SP6	62	EX-HN(204)	GV20	54
	BL23	30		ST36	44		EX-HN1	38
	BL20	27		KI3	39		JLSXX-QX	39
	BL18	18		KI6	27		GV24+	20
	BL19	14		LR3	29		GB20	14
	BL17	6		BL62	19		GV24	12
	GV9	4		ST40	15		GV14	4
	BL21	4		LR2	12		GV16	3
	GV11	4		KI1	7		EX-HN5	3
	GV10	4		ST44	7		GB15	3
	BL13	4		GB43	6		GB12	2
	BL44	2		SP10	6		GV26	3
	GV4	2		GB34	4		GB8	2
	BL35	1		SP9	5		ST21	1
	BL14	1		GB40	4		ST2	1
				GB41	3		GV13	1
EX-UE(160)	HT7	68	EX-CA(44)	KI7	3		BL10	1
	PC6	43		SP3	2		ST8	1
	PC7	16		GB44	2		GV15	1
	LI4	10		SP4	3		CV12	13
	LI11	4		SI3	3		CV4	12
	HT6	3		GB39	2		CV6	7
	TE5	2		SP1	1		CV17	3
	LU9	2		KI5	1		LR14	2
	PC5	2		LR8	1		CV8	2
	LU7	2		ST41	1		CV7	2
	HT5	2		ST45	1		ST25	1
	TE6	1		ST34	1		GB24	1
	SI4	1		KI4	1		ST27	1
	HT9	1						
	PC4	1						
	HT4	1						
	PC8	1						

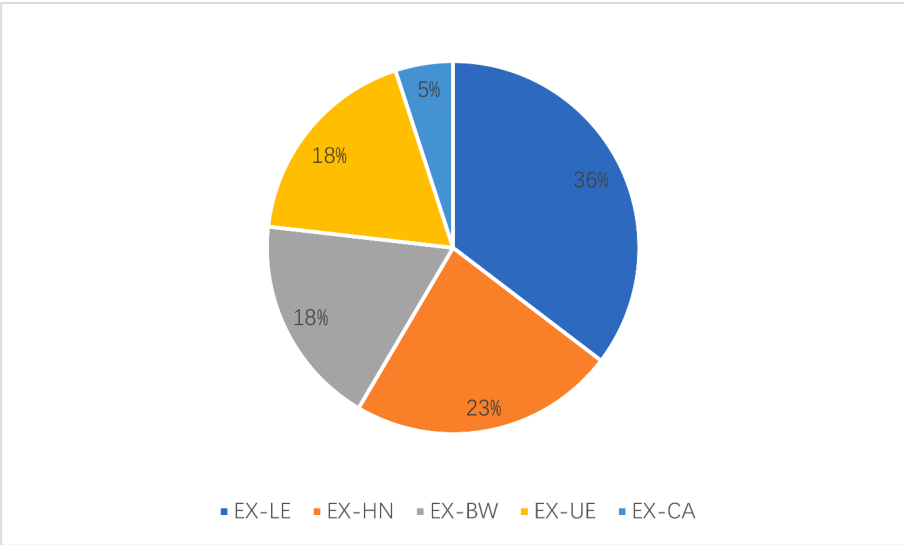


Fig. 3. Percentage of acupoints in various parts of the human body.

3.7. Analysis of association rules of acupoint combination

The “association rules” analysis is carried out based on the above frequency analysis. Similarly, the support degree was set to 20 and confidence ≥ 0.8 . We obtained 17 groups. Arranged according to confidence, the results show that shenmen (HT7) appeared 13 times, neiguan (PC6) 9 times, and sanyinjiao (SP6) 5 times, as shown in Table 6.

3.8. Network topology analysis of acupoint selection

The network topology analysis is carried out based on the above

frequency analysis. The support degree is also set to 20 and confidence ≥ 0.8 . Fig 5 shows the diagram of the acupoint combination network. The result indicates that sanyinjiao (SP6), zusanli (ST36), and shenmen (HT7) are the center, indicating that sanyinjiao (SP6), zusanli (ST36) and shenmen (HT7) are the core acupoints with a high combination utilization rate.

3.9. Clustering analysis of acupoints

The TCMISS was applied to cluster analysis of 94 selected pieces of literature. We set the number of clusters to 5 and get five core

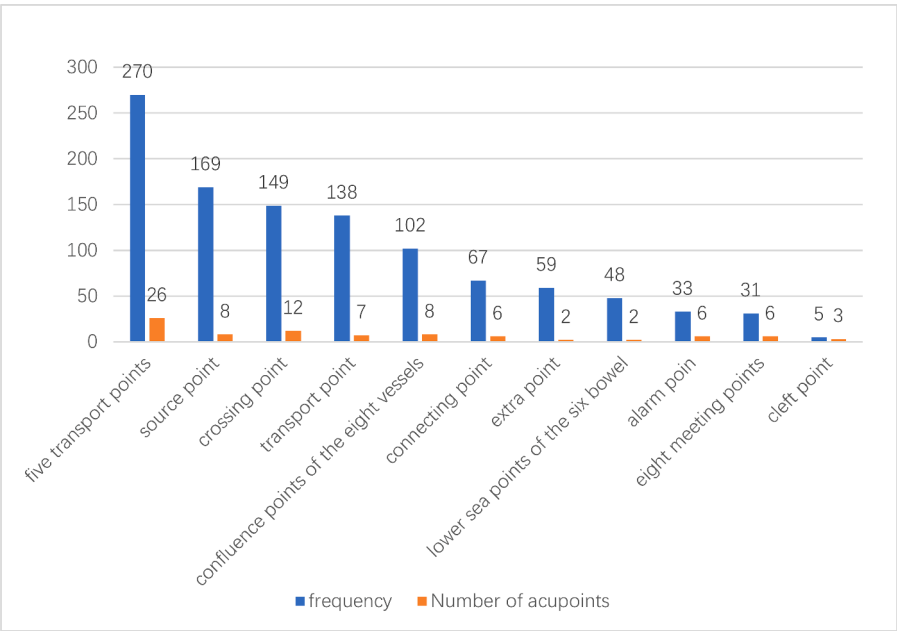


Fig. 4. Analysis of the usage of specific acupoints.

Table 4
Frequency of use of specific point.

Specific point	Acupoint	Frequency	Specific point	Acupoint	Frequency	Specific point	Acupoint	Frequency
Five transport points	HT7	68	Confluence points of the eight vessels	PC6	43	Eight meeting points	CV12	14
	ST36	44		KI6	27		BL17	6
	KI3	39		BL62	19		GB34	4
	LR3	29		GB41	3		CV17	3
	PC7	16		TE5	2		LU9	2
	LR2	12		SP4	3	Transport point	GB39	2
	LI4	10		SI3	3		BL15	40
	KI1	7		LU7	2		BL23	30
	ST44	7	Source point	HT7	68		BL20	28
	GB43	6		KI3	39		BL18	18
	SP9	5		LR3	29		BL19	14
	LI11	4		PC7	16		BL21	4
	GB40	4		LI4	10	Crossing point	BL13	4
	SP3	2		GB40	4		SP6	62
	KI7	3		SP3	2		GV20	54
	GB44	2		SI4	1		GV24	12
	LU9	2	Alarm point	CV12	14		GV14	4
	PC5	2		CV4	12		GB41	3
	TE6	1		LR14	2		LR14	2
	SP1	1		CV17	3		GB15	3
	HT9	1		GB24	1	Cleft point	GV16	3
	LR8	1	Connecting point	ST25	1		GB44	2
	ST45	1		PC6	43		GB8	2
	PC8	1		ST40	15		GV13	1
	ST41	1		TE5	2		ST8	1
	HT4	1		SP4	3		HT6	3
Lower sea points of the six bowel	ST36	44		LU7	2		ST34	1
	GB34	4		HT5	2		PC4	1
Extra point	JLSXX-QX	39						
	GV24+	20						

Table 5
Frequency of acupoint combination.

Combination of acupoints	Frequency	Combination of acupoints	Frequency	Combination of acupoints	Frequency
HT7,SP6	53	SP6,ST36	35	HT7,EX-HN1	30
HT7,GV20	41	HT7,ST36	35	HT7,KI3	30
HT7,PC6	39	HT7,JLSXX-QX	35	GV20,ST36	30
SP6,GV20	38	HT7,SP6,PC6	34	SP6,JLSXX-QX	30
SP6,PC6	36	HT7,SP6,GV20	31	HT7,SP6,ST36	29

Table 6
Association rules of acupoint combinations.

Associated acupoints A	Associated acupoints B	1-a	Associated acupoints A	Associated acupoints B	1-a
JLSXX-QX, EX-HN1	HT7	1	SP6,JLSXX-QX	HT7	0.93
BL23,BL20	BL15	1	GV20,PC6	HT7	0.93
BL23	BL15	0.97	GV20,JLSXX-QX	HT7	0.92
SP6,GV20, PC6	HT7	0.96	ST36,PC6	HT7	0.92
BL20	BL15	0.96	ST36,PC6	SP6	0.92
HT7,BL23	BL15	0.95	PC6,EX-HN1	HT7	0.91
ST36,JLSXX-QX	HT7	0.95	PC6	HT7	0.91
SP6,PC6	HT7	0.94	SP6,ST36, PC6	HT7	0.91

combinations. Core group 1 is yinjiao (CV7), baihui (GV20), guanyuan (CV4), shenmen (HT7), qihai (CV6) and sishencong (EX-HN1). It can significantly tonify the original qi, tonify blood, clear the heart, and open the orifices; Core group 2 are shenmen (HT7), neiguan (PC6), zusanli (ST36), sanyinjiao (SP6), sishencong (EX-HN1), and baihui (GV20). It can nourish the heart to tranquilize, tonify qi and engender blood, is the treatment of senile insomnia commonly used combination; Core group 3 is shenmen (HT7), sanyinjiao (SP6), zusanli (ST36), zhaozhai (KI6), neiguan (PC6), and taixi (KI3). To harmonize Yin and Yang, harmonize the heart and kidney, and calm the mind, Core group 4 are fenglong (ST40), shenmen (HT7), pishu (BL20), xinshu (BL15), neiguan (PC6) and zusanli (ST36). It can strengthen the spleen and remove phlegm. Core group 5 is shenmen (HT7), baihui (GV20), xinshu (BL15), sanyinjiao (SP6), taixi (KI3), and shenshu (BL23). Based on the transport point and governor vessel (GV), the treatment is based on the heart, spleen, and kidney. It pays attention to the root of innate endowment and the root of acquired endowment, which reflects the thought of “five viscera regulating spirit.” It also fits the characteristics of senile insomnia dual deficiency of qi and blood, liver - kidney depletion mechanism of disease. The k-means algorithm is further combined with regression model/clustering to show the effect of clustering, as shown in Fig 6, 7. Group 1 is close to the regression curve, Group 2,3,4 is more dispersed, and Group 5 has more colors. This indicates that group 1 is close to the core acupoints of this category, and group 5 has more prescriptions.

4. Conclusion

In this review, TCMISS was used to conduct data mining on literature related to acupuncture treatment of senile insomnia and study the frequency of acupoint selection, frequency of meridians, distribution patterns of human body parts, rules for selecting Specific Points, correlation analysis and cluster analysis of acupoints. It is concluded that the commonly used acupoints for the treatment of senile insomnia are shenmen (HT7), sanyinjiao (SP6), baihui (GV20), zusanli (ST36), neiguan (PC6), xinshu (BL15), taixi (KI3), sishencong (EX-HN1), anmian (JLSXX-QX), shenshu (BL23). The most commonly used meridians are bladder meridian (BL) and governor vessel (GV). The Lower Extremities (EX-LE) and Points of Head and Neck (EX-HN) were the parts with the most selected points. The five transport points are the most commonly used Specific Points, followed by the source point. The most used combinations were “shenmen (HT7) - sanyinjiao (SP6)”, “shenmen (HT7) - baihui (GV20)”, “shenmen (HT7) - neiguan (PC6)”. Five core groups have been obtained, core group 1: yinjiao (CV7), bai hui (GV20), guanyuan (CV4), shenmen (HT7), qihai (CV6), sishencong (EX-HN1); Core group 2: shenmen (HT7), neiguan (PC6), zusanli (ST36), sanyinjiao (SP6), sishencong (EX-HN1), baihui (GV20); Core group 3: shenmen (HT7), sanyinjiao (SP6), zusanli (ST36), zhaozhai (KI6), neiguan (PC6), taixi (KI3); Core group 4: fenglong (ST40), shenmen (HT7), pishu (BL20), xinshu (BL15), neiguan (PC6), zusanli (ST36); Core group 5: shenmen (HT7), baihui (GV20), xinshu (BL15), sanyinjiao (SP6), taixi (KI3), shenshu (BL23).

This study shows that acupuncture can effectively treat senile insomnia. It aims to provide the basis for acupuncture treatment of senile insomnia and provide valuable help for further research and clinical application. It also provides a reference for the acupoint selection and combination analysis of other diseases treated by data mining technology and offers new ideas for exploring the mechanism of acupuncture treatment.

CRedit authorship contribution statement

Geling Lu: Writing – original draft. **Fei Chen:** Software. **Chen Guo:** Investigation. **Jianli Wu:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

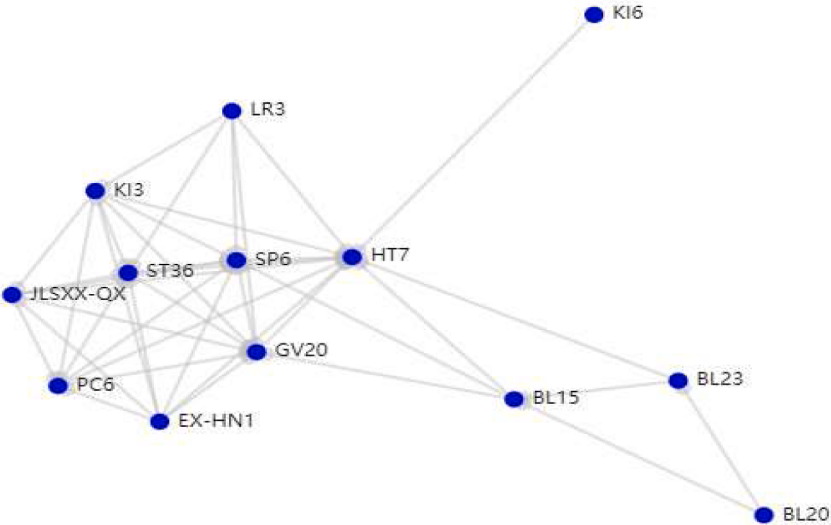


Fig. 5. Demonstration of acupoint combination network.

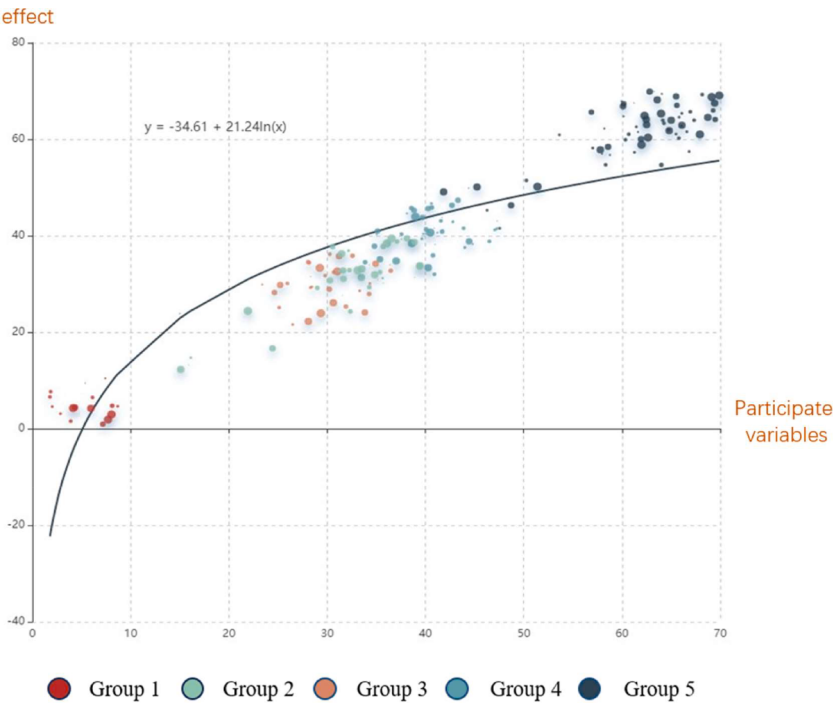


Fig. 6. Clustering analysis of acupoints(Kmeans algorithm+cluster).

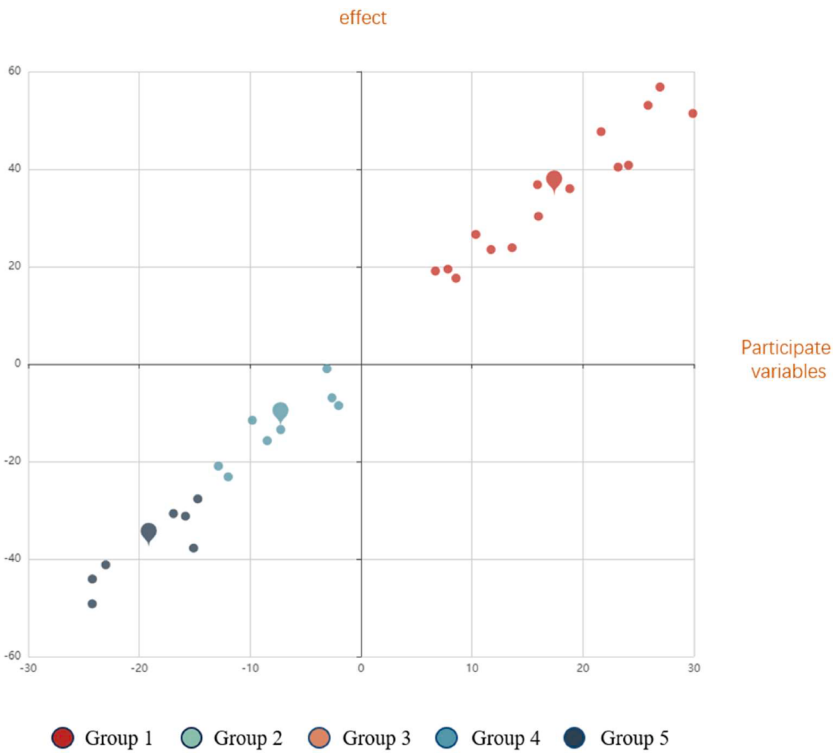


Fig. 7. Clustering analysis of acupoints(Kmeans algorithm+simulation of regression).

the work reported in this paper.

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