

Implementation of Health Belief Model to Predict Acupuncture Therapy Adherence in Low Back Pain Patients

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ABSTRACT

Background Adherence in using acupuncture services can reduce the risk of developing more severe low back pain. Low back pain patients who do not receive regular treatment will experience a high risk of injury. This study aims to determine the relationship between the construct of the health belief model and adherence in using acupuncture services.

Subjects and Method: This was a cross-sectional study carried at the Surakarta acupuncture clinic in December-March 2024. A sample of 200 low back pain patients was selected using random sampling. The dependent variable was low back pain patients. The independent variables were perceived vulnerability, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Data were analyzed using a multiple logistic regression.

Results: Adherence to acupuncture therapy in LBP patients increased with high perceived vulnerability (OR= 2.46; 95% CI= 1.09 to 5.07; p = 0.028), high perceived severity (OR= 4.07; CI 95%= 1.84 to 8.99; p = 0.001), high perceived benefit (OR= 2.57; 95% CI= 1.12 to 5.84; p = 0.024), had cues to action (OR= 2.24; 95% CI= 1.03 to 4.90; p = 0.042), and high self-efficacy (OR= 2.27; 95% CI= 1.03 to 5.00; p = 0.042). It was decreased by high perceived barriers (OR= -0.35; 95% CI= -0.15 to -0.80; p = 0.014).

Conclusion: Adherence to acupuncture therapy in LBP patients increases with high perceived vulnerability, high perceived severity, high perceived benefit, had cues to action, and high self-efficacy. It is decreased by high perceived barriers.

Keywords: Acupuncture adherence, health belief model, low back pain

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BACKGROUND

Low back pain or can be LBP (Low Back Pain) is defined as pain, muscle stiffness or muscle tension that is below the lower and upper costal edges of the fold and above the

inferior gluteal fold, is a musculoskeletal disorder caused by inappropriate physical activity with or without pain in the lower back (Asano et al., 2022). Often, this pain overlaps, some stay in the lower back area

and some spread throughout the back and even the legs (Knezevic et al., 2021).

The underlying pathological causes of LBP remain unclear. Some studies show that it is related to various factors, such as age, health status, psychological factors, occupation, etc. Due to its high incidence and recidivism rates, LBP has caused a significant social and economic burden on patients, families, and society. Therefore, it is very important to find an effective treatment for LBP (Almeida et al., 2021).

There are many ways to treat LBP complaints, such as surgery, medication, physical therapy, and exercise. Non-steroidal anti-inflammatory drugs are one of the effective drug therapies. In addition, surgical therapy often brings sequelae, such as chronic postoperative LBP and surgical failure, so many refuse surgical treatment. Therefore, many doctors and patients often look for more effective ways to treat LBP (Wu et al., 2021).

Acupuncture is one of the oldest medical practices in traditional Chinese medicine. This treatment method was discovered when primitive Chinese people discovered that pain in one part of the body could be relieved if a sting was applied to a certain area of the body (Wen et al., 2021). Yang Jizhou put together a book that presents a complete description of meridians, collaterals, acupuncture points, acupuncture manipulation methods and their indications. Many reports have shown that acupuncture has remarkable effects on the pituitary and cortical gland systems, the sympathetic nervous system and adrenal medulla, the pituitary and thyroid systems, sexual disorders, and the posterior pituitary system. Thus, some researchers put forward the theory of meridians and collaterals such as nervous tissue and body fluids. And until

now acupuncture has become a comprehensive treatment throughout the world (Ifrim et al., 2019).

Based on research (Azizi et al., 2018) that the application of the Health Belief Model to medication adherence showed that the participants consisted of 159 men and 138 women with an average age of 56.8 years (range 19-72 years). The results of the study showed that the variables perceived threats, benefits, obstacles and self-efficacy accounted for 42% of the variance in therapy adherence. The strongest predictor of compliance was found in self-efficacy. It can be concluded that the Health Belief Model is a suitable model in predicting therapy compliance in patients.

In implementing increased adherence, LBP patients need to understand good perceptions by providing the Health Belief Model, including perceived vulnerability regarding the risks of health conditions and diseases they face. Perceived severity of the seriousness of the disease and willingness to undertake clinical treatment. The susceptibility and severity of the disease is perceived as a threat. Perceived benefits are thoughts based on positive benefits or results from actions. This perception of barrier is the opposite of the perceived benefits because the negative aspects of the health action are felt. Cue to action is a readiness to take action and behavior that is motivated by the surrounding environment. Self-efficacy is the ability to carry out actions, desires, skills related to the required actions (Lam et al., 2017).

The important role of compliance with acupuncture therapy here is determining the level of recovery for patients suffering from LBP. Therefore, this research aims to analyze relevant primary research by assessing the influence of the Health Belief Model on compliance with LBP treatment and can help health practitioners as a

reference source that therapeutic treatment, especially acupuncture and the application of the Health Belief Model can increase patient adherence towards LBP complaints.

SUBJECTS AND METHOD

1. Study Design

This was a cross-sectional study conducted at acupuncture services in Surakarta, Central Java.

2. Population and Sample

In the research, the respondents were low back pain patients who used acupuncture services. A total of 200 samples LBP patients was selected randomly. The study was conducted from December to March 2024.

3. Study Variables

The dependent variable was compliance to acupuncture service uptake. The independent variables were perceived vulnerability, perceived severity, perceived barrier, perceived benefit, cues to action, and self-efficacy.

4. Operational Definition of Variables

Compliance toward the use of acupuncture services is an act of carrying out all the schedules given by the therapist to come to use acupuncture services to speed up the healing of the case being experienced is an act of carrying out all the schedules given by the therapist to come to use acupuncture services to speed up the healing of the case being experienced.

Perceived vulnerability is the perspective of low back pain patients who see that their condition will make them more vulnerable to the disease they suffer if they do not comply with the use of acupuncture services.

Perceived severity is the perspective of low back pain patients who see that their condition will get worse if they do not comply with the use of acupuncture services.

Perceived barrier is a perspective from low back pain patients who see that existing

obstacles will affect the arrival schedule for using acupuncture services.

Perceived benefit is a perspective from low back pain patients to see how much benefit is provided when they use acupuncture services.

Cues to action is the surrounding influence that encourages low back pain patients to comply with the use of acupuncture services.

Self-efficacy is the belief of low back pain patients regarding the use of acupuncture services.

5. Study Instruments

In this study, a questionnaire instrument was used. The questionnaire was created based on the health belief model theory which includes perceived vulnerability, perceived severity, perceived barriers, perceived benefits, cues to action and self-efficacy.

6. Data analysis

Univariate analysis explains and describes the characteristics of each research variable. Bivariate analysis used the Chi-Square test and multivariate analysis used multiple regression analysis.

7. Research Ethics

Aspects in this research are informed consent, anonymity, data confidentiality and research ethics approval from the Health Research Ethics Committee of Dr. Moewardi Hospital, with Number: 467/II/HREC/2024.

RESULTS

1. Sample Characteristics

The demographic profile of low back pain (LBP) patients in the Table 1 shows that the majority were female (55.5%), while males accounted for 44.5% of the sample. Most respondents resided within Surakarta (63%), with 37% living outside the city. In terms of age distribution, 65% were 50 years old or younger, while 35% were aged 50

years and above. Regarding pain severity, nearly half of the respondents (48.5%) reported moderate pain, followed by mild pain (27.5%), chronic pain (17%), and severe pain (7%). The majority of patients were

employed (84%), while only 16% were unemployed, indicating a relatively active and working population among LBP sufferers.

Table 1. Sample characteristics of LBP patients

Variable	Frequency (n)	Percentage (%)
Gender		
Male	89	44.50
Female	111	55.50
Place of living		
Surakarta	126	63.00
Outside Surakarta	74	37.00
Age		
≤50 years old	129	65.00
≥50 years old	71	35.00
Pain scale		
Mild	55	27.50
Moderate	97	48.50
Severe	14	7.00
Chronic	34	17.00
Employment		
Employed	168	84.00
Unemployed	32	36.00

2. Univariate Analysis

The descriptive analysis of Health Belief Model constructs among 200 low back pain patients shows varying levels of perception related to health beliefs and behavior. The mean score for perceived vulnerability was 4.64 (SD= 1.24). The perceived severity had a slightly higher mean of 5.09 (SD = 1.51), reflecting a strong belief in the seriousness of their condition. Perceived barriers had the lowest mean score at 2.11 (SD = 2.26) with a range from 0 to 7, suggesting that most respondents low perceived barrier to acupuncture therapy uptake. Conversely, the

perceived benefit scored highly with a mean of 7.23 (SD= 1.15) showing that patients strongly believe in the effectiveness of the treatment. Additionally, cues to action and self-efficacy also had high mean scores, at 8.44 (SD= 1.46) and 8.43 (SD= 1.52) respectively, indicating strong motivation and confidence in their ability to adhere to the therapy. These findings suggest that positive perceptions and internal motivation play a crucial role in treatment adherence among LBP patients.

Table 2. Univariate analysis (continuous data)

Variable	n	Mean	SD	Min.	Max.
Perceived vulnerability	200	4.64	1.24	0	6
Perceived severity	200	5.09	1.51	0	6
Perceived barrier	200	2.11	2.26	0	7
Perceived benefit	200	7.23	1.15	4	8
Cues to action	200	8.44	1.46	4	10
Self-efficacy	200	8.43	1.52	2	10

Table 3. The results of univariate test analysis (categorical data)

Variable	Frequency (n)	Percentage (%)
Perceived vulnerability		
Low	79	39.50
High	121	60.50
Perceived severity		
Low	79	39.50
High	121	60.50
Perceived barrier		
Low	76	37.00
High	124	63.00
Perceived benefit		
Low	74	37.00
High	126	63.00
Cues to action		
Low	81	40.50
High	119	59.50
Self-efficacy		
Low	82	41.00
High	118	59.00
Acupuncture adherence		
Not adhere	73	36.50
Adhere	127	63.50

3. Bivariate analysis

The bivariate analysis revealed significant associations between all Health Belief Model (HBM) constructs and adherence to acupuncture therapy among low back pain patients. Patients with high perceived vulnerability were more likely to adhere to treatment (73.55%) compared to those with low perceived vulnerability (48.10%), with an odds ratio (OR) of 3.00 (95% CI: 1.64–5.45, $p < 0.001$). A similar trend was seen for perceived severity, where those with high perceived severity had a much higher adherence rate (81.82%) than those with low severity (35.44%), with an OR of 8.19 (95% CI: 4.26–15.74, $p < 0.001$). On the contrary, high perceived barriers were associated with lower adherence (50.81%), while patients with low perceived barriers showed significantly higher adherence (84.21%), and the relationship was statistically significant

(OR= 0.19, 95% CI: 0.09–0.39, $p < 0.001$). Additionally, patients who reported high perceived benefits (80.16%) were far more likely to adhere compared to those with low perceived benefits (35.14%), with an OR of 7.45 (95% CI: 3.90–14.25, $p < 0.001$). Strong cues to action also played a critical role, with 78.99% of those with high cues adhering, versus 40.47% with low cues (OR= 5.46, 95% CI: 2.92–10.22, $p < 0.001$). Finally, self-efficacy had the strongest association with adherence: 79.66% of participants with high self-efficacy adhered to therapy, compared to only 40.24% with low self-efficacy, yielding an OR of 23.74 (95% CI: 8.68–64.86, $p < 0.001$). These findings underscore that higher perceived vulnerability, severity, benefits, cues to action, and self-efficacy—as well as lower perceived barriers—are strongly associated with better adherence to acupuncture therapy.

Table 4. Results of bivariate test analysis of the relationship between the health belief model and adherence with the use of acupuncture services in Low Back Pain (LBP) patients

Independent variables	Not Adhere		Adhere		OR	95% CI	p
	n	%	n	%			
Perceived vulnerability							
Low	41	51.90	38	48.10	3.00	1.64-	<0.001
High	32	26.45	89	73.55		5.45	
Perceived severity							
Low	51	64.56	28	35.44	8.19	4.26-	<0.001
High	22	18.18	99	81.82		15.74	
Perceived barrier							
Low	12	15.79	64	84.21	0.19	0.09-	<0.001
High	61	49.19	63	50.81		0.39	
Perceived benefit							
Low	48	64.86	26	35.14	7.45	3.90-	<0.001
High	25	19.84	110	80.16		14.25	
Cues to action							
Low	48	59.26	33	40.47	5.46	2.92-	<0.001
High	25	21.01	94	78.99		10.22	
Self-efficacy							
Low	49	59.76	33	40.24	23.74	8.68-	<0.001
High	24	20.34	94	79.66		64.86	

4. Multivariate Analysis

Table 5 shows that perceived vulnerability (OR= 2.46; 95% CI= 1.09 to 5.07; p= 0.028), perceived severity (OR= 4.07; 95% CI= 1.84 to 8.99; p= 0.001), perceived benefit benefit (OR= 2.57; 95% CI= 1.12 to 5.84; p= 0.024), cues to action (OR= 2.24; 95% CI= 1.03 to

4.90; p = 0.042), and self-efficacy (OR= 2.27; 95% CI= 1.03 to 5.00; p= 0.042) increased the likelihood of compliance toward acupuncture therapy. Perceived barrier decreased compliance toward acupuncture therapy (OR= -0.35; 95% CI= -0.15 to -0.80; p = 0.014).

Table 5. The results of multiple logistic regression analysis on the relationships between Health Belief Model constructs and adherence to acupuncture therapy in Low Back Pain patients

Independent Variable	OR	95% CI		p
		Upper Limit	Lower Limit	
Perceived vulnerability (high)	2.35	1.09	5.06	0.028
Perceived severity (high)	4.07	1.84	8.99	0.001
Perceived barrier (low)	-0.35	-0.15	-0.80	0.014
Perceived benefit (high)	2.56	1.12	5.84	0.024
Cues to action (high)	2.24	1.02	4.90	0.042
Self-efficacy (high)	2.27	1.03	5.00	0.042
N Observation	200			
Adjusted R ²	34.3%			
P	<0.001			

DISCUSSION

1. The relationship between perceived vulnerability and adherence to use acupuncture services

The research results showed that 60.5% of research subjects suffering from Low Back Pain (LBP) in the Surakarta area had a high perceived vulnerability. This means that many research subjects will feel vulnerable to the consequences of LBP if they do not comply with acupuncture services. The HBM continues to be one of the most accredited and widely used theories to investigate public perceptions of the benefits of prevention and barriers associated with adherence to disease prevention practices, thereby enabling models to predict their impact. A study conducted by Fallucca et al. (2022) in their research, it showed that the HBM variable was used to measure perceptions about the importance of papilloma virus vaccination which showed significant results (OR= 4.23, $p = 0.001$).

Statistical tests show that there is a positive relationship between vulnerability and compliance. LBP patients who have a high perceived vulnerability to experiencing the consequences of LBP are 2.35 times more likely to comply with acupuncture therapy than those with a low perception of vulnerability (OR= 2.46; 95% CI= 1.09 to 5.07; $p = 0.028$). These results indicate that research subjects who have a high perceived vulnerability will comply more with acupuncture therapy services than those who have a low perceived vulnerability.

Ting et al. (2023) stated that patients with higher vulnerability are more worried about the disease that attacks the patient. In the case of this study, research subjects who experienced complaints about their lower back or Low Back Pain felt that by filling out a questionnaire that included perceptions of vulnerability, it showed that their level of perceived vulnerability was high, which

means they were afraid of more severe Low Back Pain if they did not comply with the acupuncture therapy schedule.

2. The relationship between perceived severity and adherence to use acupuncture services

The research results showed that 60.5% of research subjects suffering from Low Back Pain (LBP) in the Surakarta area had a high perceived severity. This means that many research subjects felt that the level of risk for LBP disease would be worse if they did not comply with acupuncture services.

Statistical tests show that there is a positive relationship between severity and compliance. LBP patients who had the perception that LBP could have severe consequences were 4.07 times more likely to comply with acupuncture therapy compared to those with low perceived severity (OR= 4.07; 95% CI= 1.84 to 8.99; $p = 0.001$). These results indicate that research subjects who have a high perceived severity will comply more with acupuncture therapy services than those who have a low perceived severity.

Perceived severity: people's feelings about the seriousness of an illness or its non-treatment, which includes assessments of the likelihood of clinical complications (such as death, disability, and pain), and social complications (such as the impact of the condition on work, family life, etc.). Patients feel that the level of Low Back Pain they feel is endangering their health, they feel that if Low Back Pain is not treated it will cause disability and make them unable to carry out activities as usual. Complying with acupuncture therapy according to patients can reduce and keep them away from this threat (Babazadeh et al., 2019).

3. The relationship between perceived barrier and adherence to use acupuncture services

The research results showed that 84.21% of research subjects suffering from Low Back Pain (LBP) in the Surakarta area had a low perceived barrier. This means that many research subjects felt that the existing obstacles did not influence the research subjects to comply with acupuncture services.

Statistical tests show that there is a negative relationship between barriers and compliance. LBP patients who have low perceived barriers to undergoing acupuncture therapy are 0.35 times more likely to comply with acupuncture therapy than those with high perceived barriers (OR= -0.35; 95% CI= -0.15 to -0.80; p = 0.014). These results indicate that research subjects who have low perceived barriers will be more likely to comply with acupuncture therapy services compared to those who have high perceived barrier.

Perceived barriers: refers to beliefs about the real and psychological impact of a recommended action that may be a barrier to carrying out the recommended behavior (Orji et al., 2012). The potential negative aspects of the patient's home being far away, the price of therapy being too expensive and patients being afraid of needles are considered obstacles in carrying out acupuncture therapy. Judging from the results, the patients did not mind these negative aspects by showing a low barrier value and were more compliant with acupuncture therapy (Montanaro and Bryan, 2014).

4. The relationship between perceived benefit and adherence to use acupuncture services

The research results showed that 63% of research subjects suffering from Low Back Pain (LBP) in the Surakarta area had high perceived benefits. This means that many research subjects felt that the benefits of complying with acupuncture services would have a positive effect on curing LBP.

Statistical tests show that there is a positive relationship between benefits and compliance. LBP patients who have a high perceived benefit from acupuncture therapy are 2.57 times more likely to adhere to acupuncture therapy compared to a low perceived benefit (OR= 2.57; 95% CI= 1.12 to 5.84; p= 0.024). These results indicate that research subjects who have a high perception of benefit will be more likely to comply with acupuncture therapy services compared to those who have a low perception of benefit.

A study by Tareke et al. (2022) aims to develop validation of a Health Belief Model (HBM) based instrument to assess secondary school students' compliance with COVID-19 self-protection practices in Jimma, Oromia, Ethiopia. The results that have been researched show a positive relationship between perceived benefits and student compliance with implementing COVID-19 protection. Students who had high perceived benefits were more likely to implement self-protective practices (95% CI= 0.435 to 1.002, p < 0.001). Perceived benefit: refers to the belief that preventive behavior is beneficial and effective in reducing the risk or seriousness of the impact.

5. The relationship between cues to action and adherence to use acupuncture services

The research results showed that 59.5% of research subjects suffering from Low Back Pain (LBP) in the Surakarta area had high levels of action. This means that many research subjects felt that support for acupuncture compliance from the surrounding environment would have a positive effect on curing LBP.

Statistical tests show that there is a positive relationship between benefits and compliance. LBP patients who have a high

perceived benefit from acupuncture therapy are 2.57 times more likely to adhere to acupuncture therapy compared to a low perceived benefit (OR= 2.57; 95% CI= 1.12 to 5.84; $p= 0.024$). These results indicate that research subjects who have a high perception of benefit will be more likely to comply with acupuncture therapy services compared to those who have a low perceived benefit.

Research by Moradi et al. (2022) showed an effort to prevent musculoskeletal disorders as an occupational health problem to evaluate the effectiveness of educational intervention programs based on the Health Belief Model (HBM). The results show that cues to action obtained high scores from the previous test, higher cues to action influenced research subjects to pay more attention to their musculoskeletal problems ($df = 2$ $f = 0.29$ $p < 0.001$). Therefore, in line with the research results, high action cues will influence research subjects to act towards the intervention provided.

6. The relationship between self-efficacy and adherence to use acupuncture services

The research results showed that 59% of research subjects suffering from Low Back Pain (LBP) in the Surakarta area had high self-efficacy. This means that many research subjects feel confident in complying with acupuncture therapy will have a positive effect on curing LBP.

Statistical tests show that there is a positive relationship between self-efficacy and compliance. LBP patients who have high self-efficacy for undergoing acupuncture therapy are 2.27 times more likely to comply with acupuncture therapy than those with low self-efficacy (OR= 2.27; 95% CI= 1.03 to 5.00; $p = 0.042$). These results indicate that research subjects who have high self-efficacy will comply more with acupuncture therapy

services compared to those who have low self-efficacy.

In self-efficacy, the biggest determining factor is from within, the higher the efficacy value an individual has, the better the level of compliance that is carried out will be. On the other hand, if self-efficacy shows a low value, it will have an impact on poor compliance and individuals will tend to be undisciplined with the health program they are undertaking. This self-efficacy is very influential for Low Back Pain patients to comply with the acupuncture therapy schedule given, the patient's self-confidence and belief capital is very helpful in speeding up the healing process from the illness they have (Juliawati et al. 2020).

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All authors contributed to the completion of this research.

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CONFLICT OF INTEREST

None.

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