



SURVEY OF STRESS URINARY INCONTINENCE AND BACK PAIN IN BHARATANATYAM DANCERS-PILOT STUDY

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ABSTRACT

Background: - Aramandi and Muzhumandi in Bharatanatyam comprises of rhythmic stamping of the feet, jumps, twisting, and turning with rotational movements, also where knees are in contact with the floor increases demands in peripheral joints and spine. In young dancers, it indirectly places pressure on the lower tier of pelvic support which causes stress incontinence which goes undiagnosed and unreported. The objective is to explore the prevalence of stress urinary incontinence and back pain in Bharatanatyam dancers in the age group 18-30 yr old and identify potential risk factors in daily activities with activity limitation.

Method: In this cross sectional study design for a duration of 6 weeks it involved different dance institutes in and around Mangalore and Mumbai, India. 53 Bharatanatyam dancers were recruited who are trained with 5-7 years of experience, between the age group 18-30 yr old. A questionnaire was shared in Google form through various digital platforms- WhatsApp, Facebook Messenger, Gmail, and Instagram.

Results: -There were 53 responses showing prevalence of stress urinary incontinence with activities like coughing or sneezing (30.2%), bending down or lifting (9.4%) Prevalence of back pain in Bharatanatyam dancers with activity limitation like prolonged standing or walking-minimally difficult (15.4%), moderately difficult (9.6%), bending or sitting down-minimally difficult (17.0%), moderately difficult (7.5%)

Conclusion: -Thus survey stress urinary incontinence with back pain 36 Bharatanatyam dancers (67.92%) and presence of back pain 39 Bharatanatyam dancers (73.58%) are prevalent in the age 18- 30 yr old.

Key Words: - stress urinary incontinence, back pain, Bharatanatyam dancers

INTRODUCTION

The ancient Indian classical dance style known as Bharatanatyam was created in Tamil Nadu, a region in southern India. Nritta, Nritya, and Natya are the three components that makeup Bharatanatyam. Nritta emphasizes rhythm and body motions. Nritya emphasizes the body positions and motions used in dance. Natya prioritizes poetry and acting.¹This art requires a lot of physical and mental strength to perform since it combines music, rhythm, expressiveness, and sculpture-like positions. The core of this dancing style consists of simple movements, repetitive foot stamping, and significant hand motions. It calls for speedy body rotations, precise severe footwork, jumps, changes

in positions and stances, and maintenance of postures. It also calls for constant delicate alterations with the insertion of one leg positional holds (for poses). The initial five to seven years of training in Bharatanatyam are needed to be qualified for a degree.²

A good posture means the desired posture in the Bharatanatyam dance style offers the greatest degree of body control with the least amount of effort, both physiologically and biomechanically.² Bharatanatyam involves 'TATTA ADAVU' means tapping of the foot against the paved floor, this is usually done in two positions one being "half-sitting," (Araimandi) which is half squatting with heels joined and feet pointing in opposite direction and "full sitting" (Muzhumandi) position which is sitting on the dorsal side of the toes with knee bent, heels joined and hands behind the waist. The primary position held for the greatest time in the dancing form is called Natyarambham—a specific combination of arm movement with the "Araimandi" position.³ It involves maintaining a specific position over an extended length of time while using appropriate footwork and synchronized upper body motions. The most fundamental form of Bharatanatyam dance is the araimandi, which is comparable to the demiplié posture used in ballet. This dancing posture combines hip abduction, external rotation, and closed chain knee flexion.³ Posture in both the dance forms requires dancers to accomplish a variety of positions, which calls for extreme flexibility and puts a tremendous amount of strain on the musculoskeletal system.⁴

Paul et al indicated that 34.37% injuries are due to back pain in Bharatanatyam dancers.⁹ Due to their persistent efforts to perfect the araimandi form, they discovered that knee injuries were the most common kind of injuries among Indian classical dancers.¹ A high point prevalence of pain was 75% of Bharatanatyam dancers reported to have musculoskeletal pain. In 2004, Bono discovers that in the adult population, Low back pain (LBP) affects 85–90% of people at least once in their lifetime, and 15% of those people experience LBP at some point. 85% of athletes experience LBP while actively participating in sports, making it a fairly prevalent condition. In current society, low back pain is a prevalent issue in both job and leisure activities.¹⁰

Anbarasi et al conducted survey and revealed that the most common complaints among female Bharatanatyam dancers were related to their knees (48.8%), lower back and neck (24%) and ankles (12.4%), as well as their shins (2.6%) and hips (0.8%).⁶ Ballet dancers have a higher incidence of knee injuries due to stance position which during a dancer's career had a major impact on them.⁶ Nair SP et al¹⁷ did survey of Musculoskeletal Disorders among Indian Dancers in Mumbai and Mangalore in 2018 and showed the back (42.5%) followed by the knee (28.3%) and ankle (18.63%) were the most frequently reported sites of injury. Poses between both dance forms (Ballet and Bharatanatyam) require forces that exceed body weight and bent knees. While these poses may not cause immediate damage, holding them for sustained periods of time over many years could increase risk of wear and tear injury at the knee joint. Thus, Bharatanatyam dancers frequently experience knee discomfort and foot abnormalities.^{11, 12}

During repeated "Araimandi" and "Muzhumandi" positions in Bharatanatyam, iliopsoas major muscles shorten, causing an anterior pelvic tilt and an imbalance in the trunk's flexors and extensors. This increased stress on the back leads to an increase in the lordotic curve in the later stages if inefficient postures are practiced over an extended length of time, body's structure may change permanently.⁹ The local stabilization system, which allows for intersegment motion, and the global stabilization system, which enables quick and strong torques, is both a part of the core muscle component. LBP which is more common among performing artists (such as dancers), might arise from insufficient core stability.⁹ Pain that is localized between the inferior gluteal folds and the 12th rib, with or without leg pain, is referred to as LBP. If low back pain occurs within 6 weeks, it is classified as acute NSLBP (non specific low back pain); if it occurs between 6 and 12 weeks, it is classified as sub-acute NSLBP; and if it occurs after 12 weeks, it is classified as chronic NSLBP.¹⁰ A plethora of information exists regarding knee pain in Bharatanatyam dancers. However, the reasons behind back pain in Bharatanatyam dancers are not well understood. Since back pain is the second most common ailment among Bharatanatyam dancers, the goal of this study is to determine its prevalence and risk factors. Recent systematic review aims to enumerate the various risk factors for back pain with repetitive body movements according to each dance style. It concluded that

rehabilitation program should be implemented at the earliest for the dancers to be trained at an early stage.¹³

22.5 % experience urinary incontinence in dancers practicing different dance forms like hip-hop dancers followed by Bharatanatyam.¹⁴In comparison to other age groups, urinary incontinence was substantially ($p < 0.05$) higher in the age ranges of 76 to 85 years (46.7%) and 66 to 75 years (33.6%). Women between the ages of 15 and 25 were also impacted with incontinence to a degree of about 14.8%.²⁰ Urinary incontinence affects 23% to 55% of women which is more frequent in women than men.²²In women stress urinary incontinence is caused by applying pressure to the abdomen while sneezing, coughing, laughing, or engaging in heavy activities. Since the symptoms are ignored, under reported, it is implied that this is a "hidden" issue by both the carrier and other medical professionals. In the past, it was thought that either urethral hypermobility or intrinsic sphincter insufficiency was the underlying cause of stress urinary incontinence (SUI). Instead of irregularities in the position or mobility of the vagina, it is now believed that SUI is caused by an anomaly in the urethra itself.¹⁶

Young, physically active, nulliparous females also have a high prevalence of SUI; 2/3 of female gymnasts and female collegiate athletes exhibit it. Jumping and landings that cause leaks are the activities most frequently linked to a quick rise in intra-abdominal pressure. Training participants leak urine more than the competing participants (95.2% vs. 51.2%).¹⁶According to research, the pressures produced during sports demanding agility and weight bearing, such as sprinting, squash, and netball, as well as gymnastics, track and field, ball games, and trampolinists, are conveyed to the pelvic floor via the ground reaction.¹⁶ Incontinence is more likely to occur when the pelvic floor is not strong enough for this activities. SUI is also frequent in dancers and for biomechanical study purposes; dancers are comparable to athletes. Female dancers who experienced stress incontinence reported a 22.5% prevalence rate.¹⁴ Dancers spend a lot of time practicing and performing, which leads to frequent overuse injuries. Recent systematic review aim was to identify potential risk factors and explore the relationship between SUI and athletic sports and dancers in young nulliparous females. It shows that SUI occurs because of a repeated increase in intra-abdominal pressure prompting a weakened pelvic floor muscles (PFM). It is overseen moderately with few preventive techniques and PFM training particularly in young nulliparous females athletes and dancers. Bharatanatyam dancers make up 28% of the dance population who experience SUI.²¹Previous research supports that Bharatanatyam dancers with musculoskeletal diseases, such as back pain, knee pain, and ankle pain, are more likely to be between the ages of 18 and 30 or 13 and 25.^{1,6} Higher prevalence of SUI in same population in the 18 to 25 age range.¹⁴ The study's age restriction is 30 years old because Bharatanatyam dancers have a high prevalence of LBP and SUI, and because married women with children experience various physiological changes. As a result, in this study the Bharatanatyam dancers in the older age group of those over 30 are excluded. The previous recent systematic reviews on back pain and SUI in dancers focused on importance of a rehabilitation program to prevent it. Research on the prevalence of SUI and LBP in Bharatanatyam dancers is scarce. Determining the frequency of these two ailments among Bharatanatyam dancers is therefore crucial.

OBJECTIVE- Since back pain is the second most common ailment among Bharatanatyam dancers, the goal of this study is to determine prevalence and risk factors associated to stress urinary incontinence and low back pain among Bharatanatyam dancers.

METHODOLOGY –

It is a cross-sectional study design and a pilot study, therefore shortening the investigation's duration. After the institutional ethical committee of Garden City University, Bangalore, Karnataka, India (GCU-IEC) [02/2021Ph.D-2023] gave its approval, it was carried out with a passive snowballing sampling technique which recruited professional female Bharatanatyam dancers across different cities in and around Mangalore and Mumbai, India with minimum of 5-7 years of experience. Female Bharatanatyam dancers between the ages 18 – 30 years practicing and able to

understand questions in English as the survey language is written in English were recruited. Exclusion criteria included Bharatanatyam dancers who were not willing to participate in the study. This study does not include dancers who had symptoms of both SUI and LBP prior to enrollment in the dance institution. A survey was done through a questionnaire by distributing the questionnaire in an online format through Google Forms. The final design was spread in the English language and distributed the questionnaire through various digital platforms- WhatsApp, Facebook Messenger, Gmail, and Instagram. The study was conducted a duration of 6 weeks between October and November 2022 and shared on various online digital platforms to reach different dance institutes all over India.

Sample size calculation was calculated

$$N = \frac{Z_{\alpha}^2 * p * q}{d^2} \quad \text{‘*’ Indicates multiplication}$$

$$= \frac{Z_{\alpha}^2 * p * (1-p)}{d^2}$$

where :

Z_{α} =1.96 at 95% confidence interval and 85% power.

p = prevalence percentage, q=1-p

(Prevalence of previous study¹ -75%), q=25%

d=15% of p=11.25

=1.96*1.96*75*25

11.25*11.25

~57 approximately

In this study 53 trained Bharatanatyam dancers were included because of the feasibility of dancers. Of the 53 dancers, 39 dancers with only back pain where 67.92% ($n = 36$) are Bharatanatyam dancers presenting both symptoms- LBP and SUI, remaining 3 dancers represent dancers only with symptoms of SUI and 26.41 % ($n = 14$) were professional Bharatanatyam dancers who did not present with back pain and SUI. The aim of the study was stated to each dancer, and written informed consent was taken. Participant's identity and confidentiality were guaranteed.

Based on a review of the literature on prior epidemiological research among Bharatanatyam dancers, a 26-item structured questionnaire was created. Four certified professionals, including experienced dancers and physiotherapy faculty members, assessed the questionnaire's face validity. The questionnaire was pre-tested with 2 Bharatanatyam dancers before the actual data collection to check the accuracy of responses, language clarity, and appropriateness of the questionnaire.³

It is divided into three sections. Demographic data like age in years, education qualification, marriage status, occupation status information about the dancing characteristics—experience in dance in (years), learning experience levels, and dance exposure (time spent hours per week) make up the first section. The second part of the questionnaire comprises the presence of SUI in Bharatanatyam dancers with activities related to it. It included simple questions allowing the dancers to circle a response from none of the time, rarely, sometimes, Often or Always. One question was about the duration of SUI where 1 month, 2 months, 3 months or more, intermittent options were included. The presence of back pain in dancers and the daily activities that cause are covered in the third section of the questionnaire. Any self-reported pain that was present at the time the questionnaire was filled was considered to be part of the pain. It included questions allowing the dancers to mark a response from not difficult at all, minimally difficult, moderately difficult, very difficult, and unable to do. The last question was regarding duration of back pain with options ranging from 1 month, 2 month, 3 months or more intermittent.²²

STATISTICAL ANALYSIS:

SPSS statistic 24 (IBM, USA) was used for data analysis. P value was set at 0.05 for all analysis. Descriptive statistics like mean and standard deviation is used for quantitative data like age in years, experience in years and time spent hrs / day. Categorical variables like educational qualification,

experience level, occupation status and marital status are calculated with frequency and percentage. Chi square test was carried out to find out association between the two groups (low back pain present and without low back pain) in relation of categorical variables. Bivariate analysis is performed for two conditions SUI and LBP in relation to its activity limitation. Prevalence is calculated with frequency and percentage according to months- duration of pain for both LBP and SUI.

RESULTS: 53 Bharatanatyam dancers were recruited from different dance institutes in different geographical areas like in and around Mangalore and Mumbai. 25 dancers (64.1%) showed more prevalence of low back pain in the age group 18-23yr old. Out of 53 Bharatanatyam dancers, there were 31 (79.5%) dancers showed the presence of low back pain in greater than 5 yrs of learning experience, and 19 dancers (48.7%) showed the presence of low back pain more in advanced training levels. 29 dancers (74.4%) showed the presence of low back pain in singles and young unmarried women and 26 dancers (66.7) showed the presence of low back pain in semiskilled dancers who are still studying and not working. [Table 1]

The overall prevalence of LBP among dancers ($n = 53$) with 73.58 % ($n = 39/53$) suffering from LBP at the time of survey. A Chi-square test was carried out to find the association between Bharatanatyam dancers with back pain and without back pain. The prevalence of LBP among single young unmarried dancers (74.4%) and married dancers (25.6%) was found ($\chi^2 = 0.10, P = 0.75$) indicating that the marriage status among both the groups did not differ [Table 2]. No significant association was found between the presence of low back pain and educational qualification ($\chi^2 = 0.52, P = 0.47$) or occupation status ($\chi^2 = 0.11, P = 0.743$) LBP occurrence in the past year was reported highest in dancers in the advanced training level ($n = 19; 48.7\%$) and lowest in the beginners level ($n = 2; 5.1\%$) but overall the prevalence differences were not statistically significant ($\chi^2 = 1.244, P = 0.537$).

The level of dancers' daily activities (Not difficult at all, Minimally difficult, Moderately difficult, Very difficult, and unable to do) including changing position frequently, speed of gait, using handrail, need to rest frequently, taking time to dress up, stand for short periods or walk short distances, avoid bending or sitting on the floor, difficulty in turning sides in bed, sleep disturbances, avoid heavy jobs or riding vehicles(car or bike) were assessed for association with presence of LBP [Table 3]. The Chi-square test revealed no significant difference between dancers with back pain and without back pain regarding above mentioned activities.

A significant association was found in the activity of leaking urine when you cough or sneeze and the presence of low back pain ($\chi^2 = 7.81, p=0.02$) (Table 4). Also statistically significant association in the activity of rushing to the bathroom because you get a sudden urge to urinate and the presence of low back pain ($\chi^2 = 10.95, p=0.03$) The Chi-square test was calculated to find out the association between dancers with back pain and duration of SUI and it shows a very highly significant association $\chi^2 = 40.29, p < 0.001$. Dancers with back pain and duration of back pain also showed a very highly significant association $\chi^2 = 26.81, p=0.001$. (Table 5)

DISCUSSION

The goal of this study is to determine prevalence and risk factors associated to SUI and LBP in Bharatanatyam dancers. There are numerous confounding variables among all the responses for LBP or SUI and LBP with SUI. The most frequent confounding factors among Bharatanatyam dancers include age, marital status, educational background, employment position, years of dance training, training level, and amount of time spent—roughly three hours each week. The following factors are prevalent in the subgroup analysis between LBP with SUI and LBP without SUI in Bharatanatyam dancers: age (18–23 years old), young, unmarried women, semiskilled dancers who are still studying, learning experience in dance –more than 5 years, and advanced training level.

Prevalence

The prevalence of LBP was found to be 73.58% in this descriptive, cross-sectional questionnaire-based study conducted among Bharatanatyam dancers. This result is extremely similar to the 75% prevalence rate that has been documented for musculoskeletal discomfort among Indian Bharatanatyam dancers and a 34.37% prevalence rate for back injuries among dancers performing Bharatanatyam.^{1,9} The results of this study also showed that LBP and SUI were prevalent in Bharatanatyam dancers, with 67.92%. In a study done by Mahisale et al where out of 62 dancers, 14 dancers reported to have urinary incontinence(22.58%)of the cases among Indian female dancers.¹⁴

Risk factors

The Chi-square test revealed no significant difference between dancers with back pain and without back pain regarding changing position frequently, taking time to dress or more resting time, standing for short periods, bending or sitting down, turning on bed or waking up from bed and avoiding heavy jobs .Lumbar spine flexion, sitting for extended periods or in an incorrect posture, prolonged standing or sitting, moving heavy objects, and repetitive motions aggravate low back pain^{18,19}.In Bharatanatyam dance most of the movements are performed in aramandi pose but poor execution of the posture puts strain on the lumbar spine along with sustained and repeated movements which can exacerbate low back pain. A dancer's increased exposure to training increases their risk of musculoskeletal injuries. Professional dancers were more likely to develop musculoskeletal pain because they trained more frequently and intensely, with an emphasis on exact motions, than the students did. According to Sridhar A et al.¹, most dancers fall into the high (62.5%) and a medium risk (37.5%) category, so there is a direct correlation between training length and injury risk.

In this study, 64.1% showed more prevalence of LBP in the age group 18-23yr old but no significant association between presence of back pain and young age group .In a young Indian population, the number of study hours, previous history of spine problems, intense exercise, work satisfaction, monotony, and stress were found as modifiable risk factors for LBP.¹⁹ But there is opinion that women are more likely to experience urine incontinence as they age. This can be linked to increasing senile loss of muscle tone creating abnormalities in detrusor contractility and urinary sphincters, changes in hormone levels, and repetitive genital tract injuries during parturition.²⁵ Younger age groups experience fewer births, pregnancies, vaginal wear and tear, and age-related atrophic alterations.SUI is more common in younger adults than in older adults for a variety of reasons, such as pelvic floor weakening from birthing trauma, heavy lifting, and running.²⁶

In this study no significant association between the presence of LBP and educational qualification. Graduate-level Bharatanatyam dancers (74.4%) were found more prevalent with low back pain. Therefore, we are unable to link dancers' education to stress urine incontinence. The high frequency of SUI among women with lower levels of education can be linked to poor cleanliness and a lack of general knowledge about the condition. Higher-educated women have healthier lives and are more conscious of the need to contact a doctor as soon as they notice symptoms to find the association between Bharatanatyam dancers with back pain and without back pain.^{22,23}

The prevalence of LBP is found more in single young unmarried dancers (74.4%) indicating in this study there is no association between marriage status and presence of LBP. Among youthful nulliparous physically active women, it causes persistently elevated intra abdominal pressure on the pelvic floor. Overall athletes show more abdominal musculature strength which can be a variable for increased intra abdominal pressure. This inclines pelvic floor weakness causing episodes of urine leakage in young physically active nulliparous women without other risk factors.²⁵

According to the current study, no significant association between presence of back pain and occupational status where semi-skilled students (66.7%) are more in number of participants with LBP. Since they are in school level, they are likely to experience back pain and stress urinary incontinence because of increased pelvic floor muscle and lumbar strain from their daily physical

activities. They also tend to be ignorant of medical conditions such as back pain and stress urinary incontinence. But there is strong correlation between several work environmental factors, such as unclean and strenuous work, hazardous and accident-prone workplaces, time constraints, prolonged standing in awkward positions, heavy lifting and incontinence. Compared to this study findings contradict that urine incontinence was prevalent among working women and that it was associated with the type of job and environment.^{24, 25, 26}

LBP was highest in dancers in the advanced training level (48.7%) and (79.5%) more than five years of experience, but no significant association between them. Both are associated with a higher prevalence of SUI. Dancers exhibit stress urine incontinence frequently because of their demanding training schedules, long rehearsals and high-performance standards. The most common activities associated with stress urine incontinence are coughing and sneezing. The aramandi position used by dancers puts strain on the pelvic support, which raises intra-abdominal pressure. There is little information available about all of these aspects on Bharatanatyam dancers, and there is also less research to substantiate the occurrence of SUI, and LBP.

In this study, 67.92% ($n = 36$) were Bharatanatyam dancers presenting both symptoms- LBP and SUI, The Chi-square test revealed significant difference between dancers with back pain and without back pain regarding stress urinary incontinence aggravating factors like coughing or sneezing, Rushing to the bathroom because you get a sudden, strong need to urinate. The Bharatanatyam dancer's stance, known as araimandi, involves kneeling while holding out both arms in front of them for a long period. To stabilize the lower limbs in the same position, the abdominal and pelvic floor muscles in this dancing stance are both engaged. This causes an increase in intra-abdominal pressure. Similar to a ballet position, Bharatanatyam position applies pressure to the lower tier of pelvic support. Between 6 and 10 years of training, there was an increase in urinary incontinence, which was caused by overuse injuries in their lower extremities or posture-related over tightness.¹⁴

STRENGTHS/LIMITATION

First off, bias may be present in this study due to its reliance on self-reported data about SUI and LBP. Second, due to the cross-sectional approach of the current investigation, risk variables and self-reported LBP and SUI, cannot be examined causally. In addition, no basic physiological examination of the dancers' posture, flexibility, strength, muscle endurance, or cardio-respiratory capacities was conducted. These factors have the potential to negatively impact a dancer's health and increase their risk of injury. This may be the subject of upcoming studies on Bharatanatyam dancers. Additionally, the group chosen does not accurately represent the community of dancers in a particular region.

CONCLUSION

This study on Bharatanatyam dancers concluded an LBP prevalence of 73.58% which is very close to the previous studies on dancers. Also, it revealed the prevalence of SUI and LBP of 67.92 % in Bharatanatyam dancers which is very highly related to other studies in active women in the young age group (18-30 yr old). Identification of risk factors including daily activities and dance techniques at an early stage will prevent the progression of nonspecific acute LBP and SUI in Bharatanatyam dancers. As it has the potential to curb individual quality of life and increase the economic burden, creating awareness about the modifiable risk factors in the young adult population (Bharatanatyam dancers) may result in lifestyle changes, enhancing their quality of life and boosting productivity.

List of abbreviations

SUI-stress urinary incontinence

LBP-low back pain

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Table 1: Demographic and training characteristics of Bharatanatyam dancers between dancers with back pain and without back pain.(mean +/-SD)

CHARACTERISTICS	DANCERS WITH BACK PAIN (n=39) Mean +/- SD	DANCERS WITHOUT BACK PAIN (n=14) Mean +/- SD	P value
Age (18-30 yr old)	23.58 +/-4.12	21.26 +/-3.142	p=0.62 ns
Experience in years (<5 yrs, >5 yrs)	6.38 +/-1.02	6.77 +/-1.15	
Time spent hours per week	2.756 +/-0.845	2.815 +/-0.642	p=0.47 ,ns

Table 2: Sociodemographic characteristics and presence of low back pain in the past 3 months among dancers (n=53).

n=53	Number (%)	Presence of LBP % (n=39)	χ ² , P value
Educational qualification			χ ² =0.52 p=0.47 ns
Higher secondary	38 (28.31)	10(25.6)	
Graduate	15 (71.69)	29(74.4)	
Marriage status			χ ² =0.10 p=0.75 ns
Single	13 (75.47)	29(74.4)	
Married	40 (24.53)	10(25.6)	
Occupation status			χ ² =0.11 p=0.74 ns
Semiskilled	36 (67.92)	26(66.7)	
Skilled (Employed)	17 (32.08)	13(33.3)	
Learning experience of dance in years in percentage			χ ² =1.24 p=0.54 ns
Beginning level	4 (7.5)	2(5.1)	
Intermediate level	24 (45.28)	18(46.2)	
Advanced training level	25 (47.16)	19(48.7)	

Table 3: Bivariate analysis of low back pain

Activity	Low back pain present (n=39)	Low back pain absent(n= 14)	χ^2 , P value
When I change position frequently during my work.			$\chi^2=2.93$ p=0.40 ns
Not difficult (18)	12(30.8)	6(42.9)	
Minimally difficult (18)	12(30.8)	6(42.9)	
Moderately difficult(15)	13(33.3)	2 (14.3)	
Very Difficult (2)	2 (5.1)	0	
Speed of gait			$\chi^2=4.11$ p=0.25 ns
Not difficult (32)	21(53.8)	11 (78.6)	
Minimally difficult (11)	10 (25.6)	1(7.1)	
Moderately difficult(8)	7 (17.9)	1(7.1)	
Unable to do (2)	1 (2.6)	1(7.1)	
I need to use handrail of stairs			$\chi^2=5.28$ p=0.26 ns
Not difficult(40)	27(69.2)	13(92.9)	
Minimally difficult (7)	7(17.9)	0	
Moderately difficult(3)	3(7.7)	0	
Very Difficult(2)	1(2.6)	1(7.7)	
Unable to do(1)	1(2.6)	0	
I need to rest frequently			$\chi^2=8.63$ p=0.07 ns
Not difficult(26)	16(41.0)	10(71.4)	
Minimally difficult (17)	14(35.9)	3(21.4)	
Moderately difficult (8)	8 (20.5)	0	
Very Difficult (1)	1(2.6)	0	
Unable to do (1)	0	1(7.1)	
I take time to dress myself.			$\chi^2=0.38$ p=0.83 ns
Not difficult (45)	33(84.6)	12(85.7)	
Minimally difficult (7)	5(12.8)	2 (14.3)	
Very Difficult (1)	1(2.6)	0	
I can stand for short periods or walk short distances.			$\chi^2=4.88$ p=0.18 ns
Not difficult (38)	25(64.1)	13(92.9)	
Minimally difficult (8)	8(20.5)	0	
Moderately difficult(5)	4 (10.3)	0	
Very Difficult (2)	2(5.1)	1 (7.1)	
Bending and sitting down on the floor.			$\chi^2=5.69$ p=0.13 ns
Not difficult(39)	27(69.2)	12 (85.7)	
Minimally difficult (9)	8 (20.5)	1 (7.1)	
Moderately difficult(4)	4 (10.3)	0	
Very Difficult (1)	0	1(7.1)	
Turning on my side in bed is difficult			$\chi^2=2.66$ p=0.45 ns
Not difficult (35)	24 (61.5)	11(78.6)	
Minimally difficult (11)	10 (25.6)	1(7.1)	
Moderately difficult(6)	4 (10.3)	2(14.3)	
Very Difficult (1)	1(2.6)	0	
I often wake up at night			$\chi^2=2.97$ p=0.23 ns
Not difficult (39)	27(69.2)	12 (85.7)	
Minimally difficult (12)	11(28.2)	1(7.1)	
Very Difficult (2)	1(2.6)	1(7.1)	

I avoid heavy jobs in my house or in work.			$\chi^2=6.67$ $p=0.08$ ns
Not difficult (35)	22(56.4)	13(92.9)	
Minimally difficult (9)	9(23.1)	0	
Moderately difficult(6)	5(12.8)	1(7.1)	
Very Difficult (3)	3(7.7)	0	
I avoid riding vehicles(car or bike) using vehicles(car or bike) hurts			$\chi^2=6.33$ $p=0.176$ ns
Not difficult (42)	30(76.9)	12(85.7)	
Minimally difficult (7)	7(17.9)	0	
Moderately difficult(2)	1(2.6)	1(7.1)	
Very Difficult (1)	1(2.6)	0	
Unable to do (1)	0	1(7.1)	

Table 4: Bivariate analysis of SUI

Activity-leak urine or wet yourself	low back pain present (n=39)	Low back pain absent n=14	χ^2 , P value
When you cough or sneeze			$\chi^2=7.81$ $p=0.02$ sig
None of the time (29)	17(43.6)	12(85.7)	
Sometimes (8)	8(20.5)	0	
Rarely(16)	14 (35.9)	2(14.3)	
When you bend down or lift			$\chi^2=2.90$ $p=0.24$ ns
None of the time (46)	32(82.1)	14(100.0)	
Sometimes (2)	2 (5.1)	0	
Rarely(5)	5(12.8)	0	
When you walk quickly jog or exercise			$\chi^2=0.38$ $p=0.83$ ns
None of the time (44)	32(82.1)	12(85.7)	
Sometimes (1)	1 (2.6)	0	
Rarely(8)	6 (15.4)	2(14.3)	
While you undress to use the toilet			$\chi^2=2.66$ $p=0.45$ ns
None of the time (29)	19(48.7)	10(71.4)	
Sometimes (8)	7(17.9)	1(7.1)	
Rarely(13)	11(28.2)	2(14.3)	
Often(3)	2(5.1)	1(7.1)	
Before reaching the toilet?			$\chi^2=6.12$ $p=0.19$ ns
None of the time(29)	18(46.2)	11(78.6)	
Sometimes (7)	6(15.4)	1(7.1)	
Rarely(14)	1(33.3)	1(7.1)	
Often(2)	1(2.6)	1(7.1)	
Always(1)	1(2.6)	0	
Rush to the bathroom because you get a sudden, strong need to urinate			$\chi^2=10.95$ $p=0.03$ sig
None of the time(17)	8(20.5)	9(64.3)	
Sometimes (16)	15(38.5)	1(7.1)	
Rarely(12)	9(23.1)	3(21.4)	
Often(4)	3(7.7)	1(7.1)	
Always(4)	4(10.3)	0	

Table 5: Prevalence of SUI and back pain according to duration

SUI duration	Number (%)	Dancers with back pain (n=39)	BACK PAIN duration	Number (%)	Dancers with back pain
1 month	6(11.3)	6(15.4)	1 month	3 (5.7)	3(7.7)
2 months	1(1.9)	1(2.6)	2 months	2(3.8)	2(5.1)
3 months or more	7(13.2)	7(17.9)	3 months or more	3 (5.7)	3(7.7)
intermittent	22(41.5)	22(56.4)	intermittent	23 (43.4)	23(59.0)
No pain	17(32.1)	3(7.7)	No pain	22 (41.5)	8 (20.5)
Total 53		39	Total 53		39

QUESTIONNAIRE:**Demographic data**

1. Select your age 18-23 yr 24-30 yr
2. Occupation- Skilled(EMPLOYED) semi skilled
3. Marital status- Single Married
4. Educational Qualification -Higher secondary Graduate
5. Learning Experience level in Bharatanatyam -Beginning level, Intermediate level, advanced
6. Learning Experience in years in Bharatanatyam <5 yrs >5 yrs
7. Time spent per week with 1 hr spent per day in dance classes in Bharatanatyam <3 days per week, >3 days per week,

Second section:

1. Do you leak urine (even small drops), wet yourself or wet your pads or undergarments when you cough or sneeze? • None of the time • Rarely • Sometimes • Often • Always
2. Do you leak urine (even small drops), wet yourself or wet your pads or undergarments when you bend down or lift?
 - None of the time • Rarely • Sometimes • Often • Always
3. Do you leak urine (even small drops), wet yourself or wet your pads or undergarments when you walk quickly, jog, or exercise?
 - None of the time • Rarely • Sometimes • Often • Always
4. Do you leak urine (even small drops), wet yourself or wet your pads or undergarments while you are undressing to use the toilet?
 - None of the time • Rarely • Sometimes • Often • Always
5. Do you get such a strong and uncomfortable need to urinate that you leak urine (even small drops) or wet yourself before reaching the toilet?
 - None of the time • Rarely • Sometimes • Often • Always
6. Do you have to rush to the bathroom because you get a sudden, strong need to urinate?
 - None of the time • Rarely • Sometimes • Often • Always
7. How long you have these symptoms-?
 - 1 month • 2 months • 3 months or more • intermittent

Third section

When your back hurts, you may find it difficult to do some of the things you normally do. Mark only the sentences that describe you today.

1. Because of my back pain, I change position frequently during my work.
Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do
2. Because of my back pain, I walk more slowly than normal.
Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do
3. Because of my back pain, I use handrail of stairs.
Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do
4. Because of my back pain, I take rest oftenly.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

5. Because of my back pain, I take time to dress up myself.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

6. Because of my back pain, I can stand for short periods or walk short distances.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

7. Because of my back pain, I avoid bending and sitting down on the floor.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

8. Because of my back pain, I find difficulty in turning to sides in bed.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

9. Because of my back pain, I often get up from my sleep.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

10. Because of my back pain, I avoid heavy jobs in my house or in work.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

11. Because of my back pain, I avoid riding vehicles/ using vehicles hurts.

Not difficult at all • Minimally difficult • Moderately difficult • Very difficult • unable to do

12. How long you have these symptoms? 1 month • 2 months • 3 months or more • intermittent