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ORIGINAL RESEARCH

Correlation Between Social Support and HPV Vaccination Behavior of Female Sex Workers in Entertainment Venues in a Region of Guangxi, China

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Objective: To understand the current situation for social support and HPV vaccination behavior of female sex workers (FSWs) in entertainment venues and to explore the association between the support and HPV vaccination behavior.

Methods: 923 FSWs in entertainment venues in a region of Guangxi were selected as survey respondents by using intentional sampling and employing a self-developed basic information questionnaire. The social support rating and the HPV vaccination behavior scales were analyzed to determine the current status of support and HPV vaccination behavior of FSWs in entertainment venues. In addition, the correlations between these parameters were analyzed.

Results: The total score of social support of FSWs in entertainment venues was 35.13±8.10, and the score for HPV vaccination behavior was 30.08±5.73. There were significant differences between these two parameters for FSWs of different ages, monthly incomes and working hours ($P < 0.05$). Objective, subjective and social support were positively correlated with all dimensions of HPV vaccination behavior ($r = 0.212$~0.236, 0.245~0.334 and 0.113~0.152, respectively; $P < 0.01$ in all cases). Typical correlation analysis yielded a correlation between these three dimensions of social support as well as with two dimensions of HPV vaccination behavior (self-decision-making and self-efficacy) ($r = 0.373$; $P < 0.01$).

Conclusion: Social support and HPV vaccination behavior of FSWs in entertainment venues initially low. However, as social support for FSWs was increased, their behavior towards HPV vaccination was elevated. Both subjective and objective support helped FSWs in entertainment venues their behavior to HPV vaccination and to maintain their physical and mental health.

Keywords: female sex workers, social support, HPV vaccination, inoculation behavior, knowledge of HPV

Introduction

Cervical cancer is a disease that seriously affects women's health and is considered the fourth most common tumor in women. The incidence of this deadly disease is gradually increasing globally, and in low- and middle-income countries, cervical cancer ranks fourth in terms of both incidence and mortality.[1] Currently, the incidence of cervical cancer in China ranks second in the world and is on the rise.[2] Human Papillomavirus (HPV) is a sexually transmitted spherical DNA virus that causes proliferation of the squamous epithelium of human skin and mucous membranes, which in turn induces proliferative pathologic changes at the site of infection.[3] Persistent high-risk human papillomavirus infection, on

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the other hand, is the main cause of cervical cancer and its precancerous lesions.[4] Cervical cancer is currently the only malignant tumor with a clear cause that can be prevented by vaccination with the appropriate vaccine.[5] HPV vaccine can prevent 70–90% of HPV-related tumors, and the cancerous transformation and treatment of HPV infection are also closely related to whether or not to receive the HPV vaccine.[6] Studies in countries such as Australia and Sweden have found significant reductions in the incidence of cervical malignancies among children and adolescents who were vaccinated against HPV prior to the onset of sexual activity.[7,8] In addition, studies have found that HPV prophylactic vaccination of HPV-positive patients can alleviate HPV infection to a certain extent and achieve a secondary prevention effect.[9] However, due to the low awareness of HPV among the Chinese population, the lack of popularity of HPV screening, and the shortage of HPV vaccine, the HPV vaccination rate in China is generally low.[10]

Female sex workers (FSWs) refer to women who have sex with males in order to obtain material rewards, such as money. This means they have several sexual partners and they often engage in unprotected sex and other high-risk activities which can lead to HPV infection. Social support refers to the various voluntary social networks that use certain materials and spiritual means to help socially disadvantaged groups. This encompasses verbal, behavioral and emotional support from relatives and friends.[11] The social support network associated with an individual can have an important impact on his or her conceptual attitudes and conscious behavior.[12] Some research suggests that social support can further influence pro-social behavior through intra-individual factors such as social identity.[13] FSWs, as a high-risk group for HPV infection, are a key target for cervical cancer prevention and treatment, and in recent years, the use of social network interventions among homosexual men and drug users has achieved some success.[14,15] However, there are relatively few studies among FSWs.

FSWs in entertainment venues, as a category of vulnerable groups in society, have a higher risk of HPV infection and transmission due to the specificity of their occupations, with frequent sexual activities, high mobility in the workplace, hidden workplaces and a lack of HPV-related knowledge. Currently, HPV vaccination is the most effective measure to prevent cervical cancer and this practice can effectively reduce the burden of disease associated with HPV.[16–18] Some studies have shown the significance of social support in the cultivation of positive behaviors.[19] However, there is no linkage between social support and HPV vaccination behavior to explore the correlation between the two. Therefore, this paper builds on previous research findings to fill this research gap by comprehensively examining the relationship between social support and HPV vaccination behavior. The purpose of this paper is to explore the current status of social support and behavior towards HPV vaccination among female sex workers in entertainment venues. A questionnaire survey on incorporating these carried out in a region of Guangxi, China. We analyzed the correlation between social support and HPV vaccination behavior in this population of FSWs.

Subjects and Methods

Study Population

Using the intentional sampling method, 923 FSWs in entertainment venues in the city of Guangxi were selected as study subjects. Inclusion criteria: (1) FSWs working in entertainment venues where commercial sex transactions existed in an urban area of Guangxi from August 15 to October 16, 2022; (2) Volunteers were asked to participate in the questionnaire survey and verbal informed consent has been obtained; (3) The participants had never previously participated in HPV and HPV-related questionnaires. Exclusion criteria: non-autonomous completion of questionnaires. A total of 923 questionnaires were collected, of which 921 were valid questionnaires after excluding four participants with extreme options. The effective recovery rate for questionnaires was 99.78%.

Measurements Performed

The on-site questionnaire survey was conducted in an anonymous manner, and a response rate of more than 95% was regarded as a valid questionnaire. The survey consisted of three parts: a self-administered questionnaire on basic information about the study participants, the social support rating scale (SSRS), and the behavioral scale.[20] Self-compiled questionnaires on the basic information of the study participants consisted of 9 items. These were age,

ethnicity, education level, home location, monthly personal income, length of time in the current occupation, marital status and education levels of the father and mother.

Social support: The SSRS[21] compiled by Xiao Shuiyuan in 1994 was used, and this contained the three dimensions of objective support, subjective support and utilization of social support, with 10 entries. Scoring methods: entries 1–4 and 8–10 were single-choice questions, with choices 1, 2, 3 and 4 and scoring of 1, 2, 3 and 4 points, respectively. Entry 5 was scored a total score, with each item ranging from "none" to "full support" scoring 1–4 points. Entries 6–7 were multiple-choice questions, with choices such as "no" to "full support" scoring 1–4 points each. Entries 6–8 were multiple-choice questions, with choices such as "no" to "full support" scoring 1–4 points each. Entries 6–7 were multiple choice questions, such as answering "no source" with 0 points and answering "the following sources and the number of sources were counted". The statistical indicators of the scale were divided into total and dimensional scores, with the total score being the sum of the scores of the 10 items, and the dimensional scores. Objective support, subjective support and utilization of support were the sum of the scores of items 2, 6 and 7, 1, 3, 4 and 5 and 8, 9 and 10, respectively. Higher scores indicated a better state of social support. The Cronbach's alpha coefficient for the scale was measured as 0.78.

Behavioral scale: the scale had 8 entries divided into two dimensions: self-decision making and self-efficacy. Self-decision making (2 entries, 1–2) was used to assess the importance of health and the self-efficacy of the study participants in deciding to receive the vaccine. Self-efficacy (6 entries, 3–8) was used to assess the study participants' confidence in overcoming possible difficulties in receiving the HPV vaccine. The scores were "1 = strongly opposed", "2 = opposed", "3 = unsure", "4 = favorable", "5 = strongly in favor" on a Likert scale of 1 to 5, where the higher the score, the stronger the behavioral skills of the study population to receive the HPV vaccine. The Cronbach's alpha coefficient of the scale was measured as 0.87.

Statistics

This study used Epidata 3.1 to enter the data, and after verification and logical checking, the database was established. SPSS version 26.0 statistical analysis software was used for analysis. The counted information was described by the number of cases (percentage), and the measured information was used to carry out the statistical description. Either the *t*-test or one-way ANOVA was used for comparison between groups, and Pearson linear correlation and typical correlation analysis were used. Differences were considered statistically significant when $P < 0.05$.

Quality Control

All questionnaires were filled out anonymously, and the respondents were informed of the relevant precautions before the questionnaires were distributed, so as to avoid mistakes or omissions as much as possible. Questionnaires were collected on the spot, and when these were collected they were carefully examined. Any questionnaires which were deemed unclear, were clarified, revised and supplemented with the respondents and those which did not meet the requirements were eliminated.

Results

Sample Characteristics

A total of 923 questionnaires were distributed, and 921 questionnaires were validly returned, with an effective return rate of 99.78%. Among them, 87 (9.45%) were aged <20 years old, 282 (30.62%) were aged 20–26 years old, 476 (51.68%) were aged 27–45 years old and 76 (8.25%) were aged ≥46 years old. 398 were of Han ethnicity, 388 were of Zhuang ethnicity and 135 were of other ethnicities. 420 and 501 were from urban and rural households, respectively. The specific characteristics of the participants are shown in Table 1.

Social Support and HPV Vaccination Behavior Scores

The overall score of social support of the 921 FSWs in entertainment venues surveyed was 35.13±8.10 and this consisted of objective support (6.77±2.95), subjective support (21.16±5.41) and utilization of support (7.20±2.16). The behavioral scores for HPV vaccination were 8.24±1.59 and 21.84±4.78 points for self-decision and self-efficacy, respectively.

Table 1 The Basic Characteristics of the Study Population (n=921)

Population Characteristics		Number	Percentage (%)
Age	<20	87	9.45
	20–26	282	30.62
	27–45	476	51.68
	≥46	76	8.25
Ethnicity	Han ethnicity	398	43.21
	Zhuang ethnicity	388	42.13
	Other ethnicities	135	14.66
Education degree	Primary and below	52	5.65
	Junior high school	304	33.01
	High school	371	40.28
	Junior college	132	14.33
	Bachelor degree and above	62	6.73
Residence	City	420	45.60
	Rural area	501	54.40
Monthly salary	<1500	88	9.55
	1500–3799	267	28.99
	≥3800	566	61.45
Working experience (months)	<1	50	5.43
	1–6	168	18.24
	7–12	207	22.48
	>12	496	53.85
Father's highest level of education	Primary and below	260	28.23
	Junior high school	403	43.76
	High school	183	19.87
	Junior college	57	6.19
	Bachelor degree and above	18	1.95
Mother's highest level of education	Primary and below	332	36.05
	Junior high school	364	39.52
	High school	178	19.33
	Junior college	29	3.15
	Bachelor degree and above	18	1.95
Marital status	Non-married	437	47.45
	Married	360	39.09
	Divorced/widowed	124	13.46

Behavioral Influence of Social Support and HPV Vaccination

The differences in the total scores on the social support and the HPV vaccination behavior scales among FSWs in entertainment venues were significantly different according to their ages, monthly incomes and the number of working hours (P<0.05). The difference in the HPV vaccination behavior scale scores of FSWs was also different (P<0.05) when their ethnicities were taken into account. The total SSRC scores of FSWs were different as their literacy levels and marital status changed (P<0.05 in both cases). All the results are summarized in Table 2.

Analysis of the Correlation Between Social Support and HPV Vaccination Behavior

The results of correlation tests in this study showed that many of the variables examined were significantly correlated with the objective, subjective support and social support provided. In addition, both self-decisions and self-efficacy were positively correlated with the variables ($P < 0.01$ in all cases;Table 3).

Table 2 Analysis of Factors Influencing Social Support and HPV Vaccination Behavior $(\overline{X} \pm S)$

Population Characteristics	Number (n=921)	Total Social Support Score	HPV Vaccination Behavior Score
Age (year)			
<20	87	29.76±7.95	28.10±5.33
20–26	282	32.94±7.66	29.81±6.19
27–45	476	37.05±7.62	30.88±5.45
≥46	76	37.36±8.10	28.34±5.12
F	–	33.64	9.311
P	–	0.001	0.001
Ethnicity			
Han ethnicity	398	35.25±8.06	30.33±5.58
Zhuang ethnicity	388	35.17±8.26	30.44±5.90
Other ethnicities	135	34.61±7.80	28.3±5.36
F	–	0.324	7.809
P	–	0.723	0.001
Education degree			
Primary and below	52	31.06±8.86	29.00±6.50
Junior high school	304	34.48±8.21	29.83±5.61
High school	371	36.15±8.08	30.39±5.46
Junior college	132	34.93±7.09	30.80±6.33
Bachelor degree and above	82	36.00±7.94	28.82±5.64
F	–	5.53	2.159
P	–	0.001	0.072
Residence			
City	420	35.73±8.25	30.42±5.79
Rural area	501	34.62±7.95	29.79±5.67
F	–	2.087	2.779
P	–	0.037	0.096
Monthly salary			
<1500	88	30.74±8.50	29.01±5.85
1500–3799	267	33.55±7.75	28.19±5.49
≥3800	566	36.55±7.83	31.13±5.57
F	–	28.291	27.005
P	–	0.001	0.001
Working experience (months)			
<1	50	29.48±9.32	29.04±5.90
1–6	168	32.89±7.84	29.30±6.48
7–12	207	34.43±7.48	28.89±5.25
>12	496	36.74±7.85	30.94±5.50
F	–	20.681	8.545
P	–	0.001	0.001
Marital status			
Unmarried	437	32.20±7.90	30.11±6.03
Married	360	38.77±7.19	30.38±5.35
Divorced/widowed	124	34.85±7.05	29.10±5.61
F	–	75.530	2.335
P	–	0.001	0.097

Table 3 Correlation Analysis Between Social Support and HPV Vaccination Behavior

Dimension	1 Objective support	2 Subjective support	3 Utilization of support	4 Self-determination	5 Self-efficacy
1	1				
2	0.383**	1			
3	0.222**	0.341**	1		
4	0.212**	0.245**	0.152**	1	
5	0.236**	0.334**	0.113**	0.487**	1

Notes: ** represents $P < 0.01$.

Typical Correlation Analysis Between Social Support and HPV Vaccination Behavior

Typical Correlation Coefficients for Personality Traits and Quality of Life

In order to further examine the overall relationship between social support and HPV vaccination behavior, a typical correlation analysis was conducted between the two groups of variables, social support and vaccination behavior. This used social support as the X variable group (X_1=objective support; X_2=subjective support; X_3=social utilization) and vaccination behavior as the Y variable group (Y_1=self-decision making; Y_2=self-efficacy). It can be seen that two pairs of typical correlation variables were obtained, and only typical variable 1 was found to be statistically significant ($P<0.001$). The correlation coefficient of the typical correlation variable of the first pair was 0.373 (Table 4).

Construction of a Standardized Typical Correlation Model

The absolute values of the X_1 and X_2 coefficients in the standardized typical correlation model for typical variable 1 were both large, indicating that the level of the associated coefficient (U_1) for social support for FSWs in entertainment venues would be determined by X_1 (objective support) and X_2 (subjective support). The absolute value of the Y_2 coefficient in the model was larger than the other one, indicating that the standardized level of the typical correlation coefficient (V_1) would be mainly determined by Y_2 (self-efficacy; Table 5).

Typical Structural Analysis

The results of the typical structure analysis showed that the correlation coefficients between the original group of variables and the typical variables of the group and those of the other party were expressed as typical loadings and typical cross-loadings, respectively. U_1 was negatively correlated with X_1, X_2, X_1, Y_1 and Y_2, and it had the highest degree of

Table 4 Typical Correlation Analysis Between Social Support and Vaccination Behavior

Typical variable	Correlation	Eigenvalue	Wilks Statistic	F	Num D.F	Denom D.F	P
1	0.373	0.162	0.854	24.991	6.000	1832.000	0.001
2	0.087	0.008	0.992	0.000	0.000	0.000	0.000

Table 5 Typical Correlation Model Between Social Support and Vaccination Behavior

Typical Variable	Standardized Typical Correlation Model
1	U_1=−0.395X_1-0.767X_2 V_1=−0.367Y_1-0.768Y_2

Notes: U_1 is the 1st typical variable of social support; V_1 is the 1st typical variable of HPV inoculation behavior; X_1, X_2 and X_3 are the objective support dimension, subjective support dimension and the dimension of utilization of support, respectively; Y_1 and Y_2 are the self-decision-making and self-efficacy dimensions, respectively.

Table 6 Typical Structural Analysis of Social Support and Vaccination Behavior (r Values)

Variant	U_1	V_1
X_1	−0.696	−0.260
X_2	−0.929	−0.347
X_3	−0.382	−0.143
Y_1	−0.742	−0.277
Y_2	−0.947	−0.353

Notes: U1 is the 1st typical variable for social support; V1 is the 1st typical variable for HPV vaccination.

Table 7 Typical Redundancy Analysis of Social Support and Vaccination Behavior

Canonical Variable	Social Support U1		Vaccination Behavior V1	
1	X× by self	X×Y	Y× by self	Y×X
	0.498	0.069	0.723	0.101

Notes: X is social support; Y is HPV vaccination behavior.

correlation with Y_2, while V_1 was also negatively correlated with X_1, X_2, Y_1, Y_2, Y_3, and Y_4, and it was correlated to a greater extent with X_2 and Y_2, and The highest degree of correlation was with Y_4 (Table 6).

Typical Redundancy Analysis

In the typical correlation analysis, the within-group representation refers to the analysis of the proportion of the total variance explained by the typical variables to the total variance of the original variables in this group. The cross-representation refers to the analysis of the proportion of the total variance cross-explained by the typical variables to the total variance of the original variables in the other group. It can be seen that U1 explains 49.8% of the within-group variance (group of X variables) and 6.9% of the amount of cross-variance (group of Y variables; Table 7). V1 explains 72.30% of the within-group variance (group of Y variables) and 10.10% of the amount of cross-variance (group of X variables; Table 7). This suggests that 6.90% of social support could be explained by vaccination behavior, while 10.10% of vaccination behavior was accounted for by social support, ie, the effect of social support on vaccination behavior is greater than vice versa (Table 7).

Discussion

This survey showed that the age of FSWs in this region was generally younger with 51.7% being 27–45 years old. The majority were unmarried, which may be due to the nature of their trade, in order to facilitate the availability of more commercial sex partners. 54.4% of FSWs were from rural areas and 46.1% of them had engaged in this work for less than one year which also confirmed their high mobility status.[22,23] Generally speaking, FSWs were in a socially disadvantaged position, with a low level of education and low personal and family monthly incomes. This study found that the social networks of FSWs were mainly composed of three types of relationships: blood, geographic and occupational, which is consistent with the findings of Tao Feng et al.[24] Most of them had three or more family members and friends, and they also talked to their neighbors and colleagues, but only a small proportion of them participated in group organization activities. This suggested that FSWs could be guided to communicate with each other and help each other through social network members such as family members and friends around them in order to improve further their social support, survival skills and self-protection ability to prevent the spread of transmittable diseases.

The scores of the dimensions of social support of FSWs in entertainment venues in this survey showed that these workers had low levels of social support. Some related studies have concluded that social support is an effective way of coping and it can influence people's social lives. It can also influence the ways they conduct themselves as an isolated and marginalized group. They usually have low levels of social support as has been shown in previous studies.[25,26] In this survey, in addition to partial support from parents, spouses and children, other siblings and activities organized by social groups can also give greater emotional support to FSWs in entertainment venues. This result is consistent with the results from some other studies, suggesting that the support of family members may change the way FSWs perceive things, thus promoting them to adopt more positive behaviors.[27–29]

The findings showed that the self-efficacy dimension of HPV vaccination behavior among FSWs in entertainment venues in the region scored high, indicating that this group had a high level of self-efficacy. It has also been shown that those who possess self-efficacy are more likely to convert momentary motivations for participation into behavior which is associated with enduring health.[25] FSWs in entertainment venues aged 27–45 years and working for longer than 12 months had the highest scores for HPV vaccination behavior, which may be due to the fact that these women already possessed a high level of cognitive awareness that their occupation is at high risk for HPV infection. This would have also motivated them to adopt the concept of HPV vaccination. It shown that the higher the level of social support among FSWs in entertainment venues, the higher their self-efficacy, which leads to the conclusion that positive social support can enhance an individuals self-efficacy, thus leading to the adoption of safer behaviors.[30] In addition, the enhancement of these positive behaviors can further improve the health status of at-risk groups,[31] which is consistent with the results of this study.

The results of the correlation analysis showed that objective, subjective and social support of FSWs in entertainment venues were significantly and positively correlated with HPV vaccination behavior, indicating that the more social support they received, the higher the degree of HPV vaccination behavior. Both subjective and objective support could help FSWs in entertainment venues to adopt a more positive behavior to HPV vaccination. However, a study by Geng Xiaomin et al[32] showed a negative correlation between social support and problematic behaviors and similar results were shown by Liu Xia et al.[33] This study concluded that social support acted as a positive factor for HPV vaccination behavior and that effective social support can potentially increase the adoption of HPV vaccination behavior among FSWs in entertainment venues.

By using a typical correlation analysis of social support and HPV vaccination behavior of FSWs in entertainment venues, it was found that higher social support accompanied higher HPV vaccination behavior. This was consistent with the results from Li Zhuoyang's[19] study. Here, the highest correlation was found for the first pair of typical correlation variables, in which U1 mainly reflected subjective support and V1 reflected self-efficacy. This indicated that social support was influenced to a greater by subjective support and it was closely related to self-efficacy. The higher levels of subjective support were accompanied by higher self-efficacy attribution bias. The results of the redundancy analysis showed that the effect of social support on vaccination behavior was greater than the effect of vaccination behavior on social support, suggesting that this can influence their HPV vaccination behavior. Related studies have also concluded that high social supporters will be more focused on adopting self-health protection behaviors.[34]

There were some limitations in this study. The subjects of this study were all from various counties and districts in a city which limited the representativeness of the sample population. Intentional sampling was used in this study and this can lead to sampling bias. Further studies are needed to demonstrate whether the results can be extrapolated to all FSWs in different settings. The present study was a cross sectional study, and the causal relationship between social support and HPV vaccination behaviors could not be determined. This also needs to be verified in further cohort studies.

Conclusions

Relevant institutions and organizations should pay attention to the impact of social support for FSWs in entertainment venues on their HPV vaccination behavior. They should give FSWs in entertainment venues adequate emotional support and promote their HPV vaccination behavior by carrying out targeted publicity, education and consulting services. In

addition, they should reduce discrimination against these professional women and increase their humanistic care them. This study provides a scientific basis for the formulation of relevant protection and prevention strategies for FSWs in underprivileged areas worldwide.

Data Sharing Statement

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Ethical Approval

The study was reviewed by the review of the Ethics Committee of Youjiang Medical College for Nationalities and was carried out by following the World Medical Association Declaration of Helsinki. Verbal informed consent was obtained from each recruited woman before starting the questionnaire. The verbal informed consent process was acceptable and approved by the Ethics Committee of Youjiang Medical College for Nationalities. All the completed questionnaires were kept confidential. A detailed explanation of the study and its purpose was given to all women with the emphasis on the confidentiality of obtained information and that participation was completely voluntary.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted. Each author has participated sufficiently in the work to take public responsibility for the content.

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