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Analysis of the KAP (Knowledge-Attitude-Practice) and KAP's influence factors of the patients who injected Low Molecular Weight Heparin (LMWH) at home after cesarean section

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Abstract: *Exploring the Knowledge-Attitude-Practice of the patients who inject LMWH at home after cesarean section and analyzing the influence factors to provide evidence for its popularization. A self-designed general data questionnaire and a questionnaire about patients' Knowledge-Attitude-Practice were used to investigate 188 patients who inject LMWH at home after cesarean section, univariate analysis and multiple linear regression analysis were adopted to explore the influence factors related to the level of KAP. The average score of the questionnaire on KAP of home injection of LMWH in 188 patients after cesarean section was (79.38±17.54) (Total score 0-40). Education background, age and time of home injection were the influencing factors for the level of KAP of home injection of LMWH after cesarean section (all P<0.05). The studies showed that the average level of KAP of home injection of LMWH in patients after cesarean section was low, and patients lacked theoretical knowledge of home injection while the operation standardization was poor. Thus we should make the training more systematic and normative and provide pertinent guidance to strengthen patients' KAP and improve home injection normative rate.*

Keywords: *Cesarean Section; Home Injection; Knowledge-Attitude-Practice (KAP); Low Molecular Weight Heparin (LMWH); Status Survey*

1. Introduction

The prevalence of thromboembolic disease during pregnancy is 0.05%-0.2%, which is 4-5 times that of non-pregnant women. It is one of the important causes of severe perinatal complications and death among pregnant women[1] . It is most common among parturients after cesarean section, whose risk is greatest within 1 week after delivery. Low Molecular Weight Heparin (LMWH), which is formed by depolymerizing unfractionated heparin, has rapid and sustained anti-thrombotic effects[2] as well as the characteristics of high bioavailability, long half-life in the body, and low bleeding tendency. It is often used as an anti-thrombotic drug by patients at home after cesarean section. lf the drug is used improperly, adverse reactions such as skin and mucosal ecchymosis, subcutaneous nodules, and injection site bleeding will occur [3-4]. LMWH is administered by subcutaneous injection, the same as insulin. Studies have shown that patients with diabetes self-inject insulin are generally irregular and lack professional knowledge and operational skills[5]. Home injection of LMWH is similar to insulin, has gradually become popular recent years, but there are few related studies related about it. This study focuses on parturients after cesarean section, explores their knowledge level, behavioral status and influencing factors of home injection of LMWH, and provides a basis for future research on home injection of LMWH.

2. Objects and methods

2.1 Survey objects

This study was designed as a cross-sectional study, and was approved by the hospital ethics committee while the patients gave informed consent. The sample size is n = [Max (number of items)*(5-10)]*[1+10%-30%)], 10%-30% was added in case of the invalid questionnaire[6], the final sample size

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is 110-260 participants. From July 2021 to March 2024, a convenience sampling method was adopted to select patients, who had undergone cesarean section in a tertiary hospital in Wenzhou, China.

Inclusion criteria:

①Postpartum women after cesarean section;

②Venous thromboembolism (VTE) risk factor score ≥ 2 points;

③Maternal coagulation routine test results during the perinatal period are fibrinogen levels exceeding 4.0 g/L, D-dimers is higher than 0.5g/L, and the platelet count is higher than 300*1012 /L, or the hemoglobin content in the blood is 130g/L or above;

④Has no history of adverse pregnancy and childbirth such as miscarriage, fetal arrest, induced labor, or other family genetic diseases;

⑤Has not taken drugs that affect the coagulation mechanism during the perinatal period;

⑥All body functions and metabolism are normal , and there are no cardiovascular diseases, no diseases of reproductive organs, eyes, liver, kidney and other organs, no contraindications for surgery and anticoagulant drug treatment;

No traumatic surgical treatment before and after the perinatal period.

Exclusion criteria:

①lower limb injury or infection;

②received anticoagulant treatment;

③clinical examination results are not detailed.

2.2 Research Instruments

2.2.1 Risk factor score for venous thromboembolism (VTE)

The risk factor score for venous thromboembolism (VTE) during pregnancy and puerperium was used for postpartum women after cesarean section[7]. If the score is ≥ 4 points, thrombosis prevention should be considered until 6 - 12 weeks after delivery; if the score is 3 points, thrombosis prevention should be considered until 6 weeks after delivery; if the score = 2 points, thrombosis prevention should be considered for at least 10 days after delivery; if the score is <2, it is encouraged to get out of bed as early as possible.

2.2.2 General Information Questionnaire

The researchers designed a questionnaire on the general information of patients who inject LMWH at home, including age, education, occupation, household per capita income, parity, presence of pregnancy complications, family genetic history, drug used during pregnancy, source of knowledge about LMWH injection , health education received (organized by hospital or community) , used LMWH medication situation etc.

2.2.3 Questionnaire on knowledge of LMWH injection at home

The researchers reviewed the literature and combined with the basic situation of home treatment in Wenzhou China, who set up a questionnaire on the knowledge of LMWH injection at home after cesarean section. The LMWH home injection knowledge questionnaire involves 5 dimensions and a total of 20 items, including drug effects (4 items), injection site (4 items), injection method (4items),adverse reactions (4 items), precautions (4 items). Each item has three options: correct, incorrect, and don't know. A correct answer gets 1 point, and an incorrect answer or don't know get 0 point.The total score is 20 points. The higher the score, the better knowledge level presented. This study selected 30 patients in the pre-experiment. After testing, the Cronbach's alpha coefficient was 0.879. Using the same questionnaire to evaluate the patients 2 weeks apart, the Cronbach's alpha coefficient was 0.914. This study used standard scores for comparative analysis, standard scores =(actual scores of scale dimensions/full scores of each dimension)*100 and defines standard scores <75 as "poor", 75-85 as "moderate", >85 as "Good".

2.2.4 Questionnaire on behavior of LMWH injection at home

The method of injecting low-molecular-weight heparin is the same as that of insulin. Referring to the Insulin Pen Injection Behavior Questionnaire[8] ,a questionnaire on behavior of LMWH injection at

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home was developed. Five experts (2 nurses with senior professional titles in the hospital, 2 nurses with intermediate professional titles, and 1 nursing expert with senior professional titles in the university) were hired to evaluate the content validity. After a pre-survey of 30 patients, it was shown to have good reliability and validity. Cronbach's alpha coeffcient is 0.925. Using the same questionnaire to measure the results after 2 weeks, Cronbach's alpha coefficient is 0.919. The scale has 10 items in total, including: washing hands before injection; correctly mixing the drug solution before injection; disinfecting skin before injection; changing injection sites regularly; skin self-examination before injection; pinching the skin at the injection site during injection, removing the needle and release the skin once finish; there should be at least 1cm between the two injection points; when injecting into the abdomen, avoid the area within 5cm in diameter around the umbilicus; stop for 10 seconds after injecting the drug solution and pull it out; dispose of the syringe correctly after the injection. A 5-point Likert scale is used, never (0/10 times) gets 0 point,occasionally (1-2/10times) get 1 point, sometimes (3-6/10 times) gets 2 points, often(7-9/10 times) is counted as 3 points, each time (10/10 times) is counted as 4 points, and the total score range from 0-40 points. This study uses standard scores for comparative analysis. The higher the score, the better the LMWH injection behavior of the parturients. Standard score =(actual score of scale dimension/full score of each dimension)*100, and defined standard score <75 points as “poor”, 75-85 points as “median”, >85 points as “good”.

2.2.5 Data collection method

Two investigators of the research team received unified training, strictly screened the participants according to the inclusion criteria, and signed informed consent forms at the same time. The investigator introduced the purpose and significance of this study to the participants in detail and guided them to fill in the questionnaire. After the questionnaire was collected, the investigator checked whether there were any missing or unclear answers and made supplements timely. The original data was entered by two persons, and 20% of the data were randomly reviewed to ensure the accuracy and authenticity of the data.

2.2.6 Statistical Analysis

SPSS 22.0 statistical software was used to conduct single-factor variance analysis, independent sample t-test, multiple linear regression analysis on the research data. The count data is expressed as percentage (%), and the measurement data is expressed as mean ± standard deviation ($\bar{X}$ ±S). when $p<0.05$, it means that the comparison difference is statistically significant.

3. Results

3.1 General information of patients

In this study, 260 questionnaires were distributed, and 248 valid questionnaire points were collected with an effective collected rate of 95.38%. There were 248 participants in the survey, all of whom were female; aged between18-40 years old, with an average age of 27.39 ± 4.74 years. The other general information was shown in Table 1.

Table 1. Single factor analysis of factors affecting knowledge and behavior of LMWH injection at home (n=248)

Items	*n*	*Knowledge score*	*t or F*	*P value*	*t or F*	*P value*
Age			*14.258*	*0.000*	*16.333*	*0.00*
<25	*90*	*14.38±3.59*				
25-35	*142*	*16.74±3.10*				
>35	*16*	*14.63±3.86*				
Education Level			*122.566*	*0.000*	*167.178*	*0.000*
Primary school	*3*	*9.00±1.00*				
Junior school	*16*	*9.56±1.67*				
High school or technical secondary school students	*44*	*12.30±1.95*				
Junior college	*99*	*16.26±2.49*				
Bachelor degree and above	*86*	*18.67±1.51*				
Occupation			*43.529*	*0.000*	*44.321*	*0.000*
Company staff	*110*	*18.26±2.05*				
Business/service	*46*	*13.39±2.65*				
Worker	*9*	*11.22±1.56*				
Individual	*33*	*13.91±2.85*				
Housewife	*50*	*15.04±3.82*				
Household per capita income			*37.143*	*0.000*	*40.229*	*0.000*

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<3000	*48*	*12.81±3.39*				
3000-5000	*130*	*15.98±3.10*				
>5000	*70*	*17.79±2.83*				
Parity			*8.083*	*0.000*	*4.149*	*0.017*
one	*164*	*16.18±3.33*				
two	*76*	*15.71±3.67*				
Three and above	*8*	*11.25±2.12*				
Pregnant complications			*2.057*	*0.041*	*1.683*	*0.094*
yes	*95*	*16.45±3.47*				
no	*153*	*15.52±3.49*				
Family genetic history			*-0.412*	*0.681*	*-0.655*	*0.513*
yes	*43*	*15.67±3.79*				
no	*205*	*15.92±3.45*				
Drug use during pregnancy			*8.378*	*0.000*	*8.399*	*0.000*
yes	*199*	*16.69±3.11*				
no	*49*	*12.55±3.06*				
Health education			*7.406*	*0.000*	*7.463*	*0.000*
yes	*138*	*17.25±2.69*				
no	*110*	*14.15±3.66*				
Regularly test coagulation function of blood			*10.561*	*0.000*	*7.827*	*0.000*
yes	*236*	*16.18±3.29*				
no	*12*	*9.83±1.95*				

3.2 Knowledge score on LMWH injection at home

The total score of knowledge of LMWH injection at home for parturients after cesarean section was 15.88±3.51 points, and the standard score was 79.38±17.54 points. The overall score of knowledge was at a medium level that the drug injection method scored poorly, with a standard score of 74.60±18.13, the results were shown in Table 2.

Table 2. Knowledge score of LMWH injection at home (n= 248)

Dimensions	*Score range(points)*	*Actual score (points, x±s)*	*Standard score (points, x±s)*	*Average score (points, x±s)*
Drug effects	*0-4*	*3.94±0.82*	*82.36±20.59*	*0.79±0.16*
Injection sites	*0-4*	*3.16±0.78*	*78.93±19.41*	*0.63±0.16*
Injection method	*0-4*	*2.98±0.73*	*74.60±18.13*	*0.60±0.15*
Adverse reactions	*0-4*	*3.09±0.85*	*77.22±21.34*	*0.62±0.17*
Cautions	*0-4*	*3.35±0.76*	*83.77±19.12*	*0.67±0.15*
Total	*0-20*	*15.88±3.51*	*79.38±17.54*	*3.18±0.70*

3.3 Behavior score of LMWH injection at home

The average score of patients behavior of LMWH at home after cesarean section was 33.75±5.43, and the standard score was 84.38±13.58. The overall level of behavior score was relatively moderate. Among them, the item of “mix the drug solution correctly before injection” and “handle the syringe correctly after injection”scored poorly, as shown in Table 3.

Table 3. Behavior score of LMWH injection at home (n=248)

Items	Score range (points)	Actual score (points, x±s)	Standard score (points, x±s)
Wash your hands before injection	0-4	3.56±0.65	88.91±16.16
Properly mix the drug solution before injection	0-4	2.80±0.96	69.96±24.12
Skin disinfection before injection	0-4	3.93±0.25	98.29±6.33
Change injection sites regularly	0-4	3.30±0.67	82.56±16.71
Skin self-examination before injection	0-4	3.20±0.68	80.04±16.98
Pinching the skin at the injection site during injection, removing the needle and release the skin once finish	0-4	3.67±0.51	91.83±12.78
There should be at least 1cm between the two injection points	0-4	3.48±0.62	87.10±15.58
When injecting into the abdomen, avoid the area within 5cm in diameter around the umbilicus	0-4	3.33±0.77	83.27±19.28
After the injection of the medicine solution is completed , stop for 10 seconds and pull it out	0-4	3.55±0.60	88.81±15.03
Properly dispose of syringe after injection	0-4	2.92±0.80	72.98±20.02
Total	0-40	33.75±5.43	84.38±13.58

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3.4 The single-factor analysis of factors affecting the knowledge of home injection of LMWH and the behavior of LMWH injection at home for parturients after cesarean section

Age, education level, occupation, Household per capita income, parity, drug use during pregnancy, Health education, and regularly test coagulation function of blood were factors affecting knowledge and behavior of LMWH injection at home, as shown in Table 1 for details.

3.5 Multiple linear regression of knowledge scores and behavior scores of LMWH injection at home

Taking the total score of LMWH injection knowledge as the dependent variable, multiple stepwise linear regression analysis was conducted on statistically significant variables in the single factor analysis, including age, education level, occupation, household per capita income, parity, drug use during pregnancy, received health education and regular review of coagulation function are affecting factors. The independent variable assignments are: age (<25years old =0, 25-35 years old =1, >35 years old =2), education level (primary school=0, junior high school=1 , high school or technical secondary school=2, junior college-3, bachelor degree and above=4),occupation (housework=0,individual=1, worker=2, business/service=3, company staff=4), household per capita income (<3000 Yuan =0.3000-5000 yuan =1,>5000 yuan =2), parity (one=0, two = 1, three and more = 2), medication use during pregnancy (no=0, yes=1), received health education (no =0, yes = 1), regular test of coagulation function of blood (no =0, yes =1). The results show that age,education level, household per capita income, parity, and drug use during pregnancy are factors that influence the knowledge score of home injection of low molecular weight heparin in patients after cesarean section, which was shown in Table 4. Education level, household per capita income, drug used in pregancy are factors that affecting the behavior score of LMWH injection, which was shown in Table 5.

Table 4. Multiple linear regression analysis of knowledge scores for LMWH injection at home (n=248)

Variable	*B*	*Standard error*	*Beta*	*t*	*p valuse*
Constant	*6.568*	*0.621*		*10.579*	*0.000*
Age	*0.671*	*0.276*	*0.112*	*2.429*	*0.016*
Eduactional level	*2.449*	*0.194*	*0.660*	*12.650*	*0.000*
Occupation	*0.126*	*0.088*	*0.058*	*1.437*	*0.152*
Household per capita income	*0.488*	*0.226*	*0.095*	*2.161*	*0.032*
parity	*-0.539*	*0.270*	*-0.085*	*-1.998*	*0.047*
Drug used during pregnancy	*1.043*	*0.365*	*0.119*	*2.857*	*0.005*
Marternity education	*-0.132*	*0.308*	*-0.019*	*-0.429*	*0.668*
Regularly test the blood of coagulation function	*0.081*	*0.665*	*0.005*	*0.122*	*0.903*

Table 5. Multiple linear regression analysis of behavior scores for LMWH injection at home (n=248)

Variable	*B*	*Standard error*	*Beta*	*t*	*p valuse*
Constant	*17.557*	*0.877*		*20.018*	*0.000*
Age	*0.524*	*0.390*	*0.056*	*1.342*	*0.181*
Eduactional level	*4.183*	*0.273*	*0.728*	*15.294*	*0.000*
Occupation	*0.082*	*0.124*	*0.024*	*0.662*	*0.509*
Household per capita income	*0.872*	*0.319*	*0.110*	*2.734*	*0.007*
parity	*0.340*	*0.381*	*0.035*	*0.892*	*0.373*
Drug used during pregnancy	*1.263*	*0.516*	*0.093*	*2.447*	*0.015*
Marternity education	*-0.190*	*0.435*	*-0.017*	*-0.436*	*0.663*
Regularly test the blood of coagulation function	*1.117*	*0.940*	*0.044*	*1.189*	*0.236*

3.6 Analysis on the correlation between knowledge and behavior of LMWH injection at home

Pearson correlation analysis was performed on the knowledge scores and behavior scores of LMWH injection at home that showed there was a significant positive correlation between injection knowledge and behavior (r=0.947,P<0.001), as shown in Table 6.

Table 6. Correlation analysis between knowledge and behavior of LMWH injection at home (n=248)

		Total knowledge score	*Total behavior score*
Total knowledge score	*Correlation coefficient*	*1*	*0.947***
	p value		*0.000*
Total behavior score	*Correlation coefficient*	*0.947***	*1*
	p value	*0.000*	

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4. Discussion

4.1 Current knowledge level of LMWH injection at home for parturients after cesarean section

The research results showed that the knowledge score of LMWH injection at home was generally at a medium level. Among them, the dimension score of drug injection method was poor, and the scores of other dimensions were at a medium level. In terms of drug injection methods, most patients were confused at tramuscular injection with subcutaneous injection; some patients did not know how to tighten the skin when injecting the drug, and they mistakenly use cotton swabs to press the injection site hardly when removing the needle. As for the possible reasons was that the Chinese tradition has the custom of "confinement". During the "confinement period", the mother's role was strengthened, and the paying attention to herself was reduced, resulting in a reduced acceptance of knowledge. Therefore, while providing puerperal health education to patients during discharge follow-up, nurses should also provide education on home injection of LMWH to ensure that patients understand and accept the knowledge, so as to develop correct and effective behavior of LMWH injection at home.

4.2 Current behavior status of LMWH injection at home for parturients after cesarean section

The results showed that the behavioral scores of LMWH injection at home for patients after cesarean section were generally at a medium level. Among them, the behaviors of "mixing the liquid medicine correctly before injection" and "handling the syringe correctly after injection" have poor scores, "skin self-examination beforeinjection", "changing injection sites regularly", "avoiding 5cm diameters around the umbilicus when injecting into the abdomen" behavior scores were moderate. The formation of behavioral habits was a long process, consolidation and strengthening it through continuous operational practice. Therefore, we must constantly emphasize the importance of persistence to patients, try to standardize every step in the injection process, and must not simplify or skip steps for convenience. When patients are discharged from the hospital, nurses can provide health education to patients based on the harm that incorrect injection of the drugs, and improve the implementation rate of patients' correct home-injection of LMWH.

4.3 Factors influencing the knowledge and behavior of LMWH injection at home for parturients after cesarean section

Multiple linear regression analysis showed that age, education level, household per capita income, parity, and drug used during pregnancy are influencing factors on knowledge score. Knowledge level of LMWH injection=6.568 + 0.671*age + 2.449*education level + 0.488*household per capita income - 0.539*parity + 1.043*drug used during pregnancy. Among them, educational level had the greatest impact on patients' knowledge level. It might be that people with higher education levels have strong knowledge acceptance capabilities and have more channels and opportunities to gain access to injection knowledge at home. At the same time, patients who were younger, had fewer parities, had higher per capita household income, and had used drugs during pregnancy would have a higher level of knowledge score of LMWH injection at home, suggesting that these patients have a stronger awareness of self-care and stronger learning ability.

Educational level, household per capita income, and drug used during pregnancy are also factors that influence the behavior of LMWH injecting at home. The behavioral level of LMWH injecting at home =17.557 +4.183*education level +0.872*household per capita income + 1.263*drug use during pregnancy. Among them, education level had the greatest impact on the behavioral level. It might be that patients with higher education levels are more receptive to new things, had higher recognition of home injection, and were more able to actively cooperate with home injection. At the same time, patients with high per capita household income and those who had used drugs during pregnancy would have a higher level of home injection behavior. These patients had less financial pressure, with some experience in home medication, and were more concerned about themselves. Thus, levels of home injection behavior were also higher.

4.4 Correlation between knowledge and behavior of LMWH injection at home for parturients after cesarean section

The results of the correlation analysis between the knowledge and behavior of home injection of LMWH showed that there was a positive correlation between them. The better of knowledge level was,

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the higher execution rate of the behavior would be. The “knowledge-attitude-behavior model” was also known as the “knowledge, belief, and action” model, divides people's behavior into three continuous processes of acquiring knowledge, generating beliefs, and forming behaviors [9] . It was a progressive relationship. Knowledge was the formation of positive beliefs and attitudes. The basis, correct beliefs and attitudes are the driving force for changing behavior. Therefore, it is necessary to accurately and comprehensively popularize the knowledge of LMWH injection at home to patients, emphasize the adverse consequences of incorrect injections and the benefits of correct injection, so that patients understand the importance of standard injection of LMWH, and encourage family members to supervise, visit hospitals and community hospitals should continue to do the follow-up work to ensure the continuity of LMWH injection at home.

5. Summary

With the popularization of postpartum anti-coagulation therapy, more and more parturients need to inject LMWH at home, but there is almost no relevant research in China. The author took women who received home injection of LMWH after cesarean section as an example. They fully used the theory of "knowledge, belief and action" and combined the patient's demographic characteristics and pregnancy and childbirth conditions to analyze the situation of home based LMWH injection. Health education encourages patients to inject at home, providing new ideas for home anti-coagulation treatment. However, the results of this study may not fully cover the current situation of home injection of anticoagulant drugs for patients undergoing home anti-coagulation therapy. This is also a direction that we need to continue to explore in the future.

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