# DETERMINATION OF NURSES' KNOWLEDGE LEVELS REGARDING INTRAMUSCULAR INJECTION TO THE VENTROGLUTEAL AREA

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**Abstract:** This study was aimed to determine nurses' knowledge levels regarding ventrogluteal (VG) area injection. This descriptive and cross-sectional study involved 121 nurses in Türkiye between December 2018 and March 2019. The nurses' descriptive characteristics form and the knowledge suggestions form were completed. Statistical analyzes included the Mann Whitney U test, Kruskal Wallis test, and Spearman correlation. It was found that 61.2% of the nurses received training for the VG area, most nurses (69.4%) never injected the VG area, and 59.5% of those who applied it only once a week. The correct mean of nurses' information suggestions regarding VG area injection was 6.76±3.92. There was a statistically significant difference between the knowledge levels of those over the age of 40 (Mean Rank=45.97) and those under the age of 30 (Mean Rank=70.73) (P=0.022). It was found that the knowledge level of nurses who received training on VG injection, applied VG injection in the department where they worked, and who applied VG injection at least once a week were higher than the others (P<0.05). A weakly negative, statistically significant linear relationship was found between age (r=-0.284, P=0.002), total professional working time (r=-0.265, P=0.003) and knowledge level. In this study, the mean knowledge of nurses regarding the VG area was determined to be slightly lower than the medium level. In order for nurses to have up-to-date information, it is recommended to provide in-service training at regular intervals and to measure training outcomes through exams. In addition, the implementation and supervision of VG area injection in clinics will contribute to the widespread use of VG area in intramuscular injection practice.

**Keywords:** Nurses, Intramuscular injections, Knowledge

## 1. Introduction

Intramuscular injection is one of the most commonly preferred methods of parenteral drug administration. With an intramuscular injection, the drug is administered into the deep muscle tissue under the subcutaneous tissue (Göçmen Baykara et al., 2019; Akbıyık, 2021). Various areas are used for intramuscular injection, and it is stated in the literature that the VG area is the most reliable area (Taylor et al., 2008; Berman et al., 2008; Potter et al., 2009; Kara et al., 2015; İnce et al, 2023). Despite this, it seems that the use of the dorsogluteal area is higher in nurses (Gülnar and Özveren, 2016; Sarı et al., 2017; Şanlıalp Zeyrek and Kuzu Kurban, 2017; Arslan and Özden, 2018; Legrand et al., 2019).

The VG is an area where complications are less common than the dorsogluteal area (Gülnar and Çalışkan, 2014; Tuğrul and Denat, 2014; Oliveira et al., 2015; Kara et al., 2015). The ventrogluteal area has thin subcutaneous fat tissue, allowing the needle to reach the muscle more easily, and since it is far from the rectal region, the risk of contamination is low. In addition, the VG is a safe area for all patients since it is away from large blood vessels and

nerves. Patients feel less pain in the VG area compared to the dorsogluteal area and the patient satisfaction level is higher (Güneş et al., 2013; Tuğrul and Khorshid, 2014; Yilmaz et al., 2016; Isseven and Sagkal Midilli, 2020; Apaydın and Öztürk, 2021; Roldán-Chicano et al., 2023; İnce et al., 2023). It has been determined that less bleeding and hematoma occur in injections applied to the ventrogluteal area compared to the dorsogluteal area (Apaydın and Öztürk, 2021; Roldán-Chicano et al., 2023). However, studies show that the VG area is not used effectively (Gülnar and Çalışkan, 2014; Sarı et al., 2017; Şanlıalp Zeyrek and Kuzu Kurban, 2017; Arslan and Özden, 2018; Legrand et al., 2019). This is because nurses lack sufficient knowledge about the VG area and are not accustomed to using it (Sarı et al., 2017; Arslan and Özden, 2018; Sü and Bekmezci, 2020). On the other hand, it is known that the rate of VG injection among nurses increases with education (Gülnar and Özveren, 2016; Şanlıalp Zeyrek and Kuzu Kurban, 2017).

Studies addressing the knowledge levels of nurses regarding VG site injection are quite limited (Gülnar and Çalışkan, 2014; Gülnar and Özveren, 2016; Şanlıalp Zeyrek and Kuzu Kurban, 2017). In this context, it is

important to assess nurses' knowledge levels regarding VG area injections. It is also thought that this study will increase nurses' awareness of VG area injections and their preference for the VG area for intramuscular injections.

This study was conducted to determine the knowledge levels of nurses working in a public hospital regarding intramuscular injection into the VG region.

## 2. Materials and Methods

We designed a descriptive and cross-sectional study to determine the knowledge level of nurses working in a public hospital regarding intramuscular injection into the VG area.

This study was conducted between December 2018 and March 2019. The sample of the study consisted of 121 nurses working in a state hospital in Türkiye.

The data were collected with the "Nurses' descriptive characteristics form" and "The knowledge suggestions form" created by the researcher in line with the literature (Gülnar and Çalışkan, 2014; Gülnar and Özveren, 2016; Şanlıalp Zeyrek and Kuzu Kurban, 2017). Expert opinion was obtained before the study and then the necessary arrangements were made.

Nurses' descriptive characteristics form: This form consists of 9 questions about the demographic and working characteristics of nurses.

The knowledge suggestions form: This form contains a total of 16 correct and incorrect statements prepared to determine the nurses' knowledge levels regarding VG area injection application. Participants were asked to choose one of the options "correct", "wrong" or "I don't know" for these propositions. The form was developed by the researcher and had a Cronbach Alpha reliability coefficient of 0.91 after content validity was performed.

The dependent variable of the research is the average of the scores they received from the information propositions regarding VG area injection, and the independent variables are the descriptive characteristics of such as age, gender, education level, working unit, total professional working time, working time at the current workplace, status of receiving training for VG injection, VG training where it is received, VG injection application status in the unit where worked, VG injection application frequency.

In this study, statistical analyzes were performed using the SPSS (Version 21.0) package program. Normality distribution was examined with Kormogorov-Smirnov and Shapiro-Wilk tests. Descriptive statistics are presented as numbers and percentages. Age, which is a continuous variable, is presented as the mean±standard deviation of total professional working time years in current institution. Mann Whitney U test and Kruskal Wallis test were used to evaluate the descriptive characteristics of the nurses and their knowledge level

regarding VG injection application. The relationship between nurses' descriptive characteristics and their knowledge levels was examined with Spearman correlation analysis. Additionally, the data were evaluated at the P<0.05 significance level and 95% confidence interval (Önder, 2018).

## 3. Results

As shown in Table 1, the average age of the nurses was 31.69±7.702, 48.8% was 30 years below, 35.5% was between 30-40 years and 15.7% was 40 years above. The majority of nurses was women (87.6%) and university (56.2%). 78.5% of the nurses was working in inpatient services and 21.5% was working in intensive care. The average professional working years of nurses was 9.893±7.669, the highest rate (35.5%) was composed of nurses who have worked for less than 5 years, and the second (26.4%) was composed of nurses who have worked for 6-10 years. The average number of years of work at the current workplace was 3.24±3.940 and the rate of employees with less than 3 years (72.7%) was the highest.

61.2% of the nurses stated that they received training on the VG injection, 59.5% stated that they received this training at school, 69.4% stated that they never injected the VG area, and 59.5% stated that they applied it once a week (Table 2).

Table 3 shows the distribution of responses to the suggestions regarding VG injection. Accordingly, the nurses stated that the VG area position for injection is easier than the others (63.6%), that it is not used only in adults (46.3%), that irritating and oily solutions can be administered from this area (33.9%), and that the palm is used to determine the area. The lower part of the femur is located in the greater thoracanter (61.2%), the gluteus medius muscle in the region is sufficiently developed in infants (over 7 months) (55.4%), the region includes the gluteus medius and gluteus minimus muscles (43%), the region is located in the rectum. The risk of fecal contamination due to its remoteness is low (66.1%), the area can be used in weak patients (25.6%), massage of the area after injection is not recommended (8.3%), injection-related nerve damage, tissue necrosis and pain in the area. No complications were observed (36.4%), the right hand was used to determine the area if the injection was to be made on the left side, the left hand was used if the injection was to be made on the right side (29.8%), the area was the safest (55.4%), and the area could be injected with up to 4 ml of medication. They stated that it can be detected (52.9%), that the subcutaneous tissue in the region is thinner (28.9%) and that the detection of the region is based on objective data (51.2%). It was also determined that 49.6% of the nurses thought that they would harm the patient during the VG area injection. The correct mean of the nurses is 6.760±3.922.

**Table 1.** Descriptive characteristics of nurses (N=121)

| Descriptive Characteristics | n | % | X̄±Sd (min- max) |
|---|---|---|---|
| Age | | | 31.69±7.702 (20-52) |
| Aged 30 years below | 59 | 48.8 | |
| 30-40 | 43 | 35.5 | |
| Aged 40 years above | 19 | 15.7 | |
| Gender | | | |
| Female | 106 | 87.6 | |
| Male | 15 | 12.4 | |
| Education | | | |
| Health vocational high school | 23 | 19.0 | |
| Associate degree | 22 | 18.2 | |
| University | 68 | 56.2 | |
| Higher education level | 8 | 6.6 | |
| Working Unit | | | |
| Inpatient unit | 95 | 78.5 | |
| Intensive care unit | 26 | 21.5 | |
| Total Professional Working Time | | | 9.893±7.669 (0.5-33) |
| 5 years and less | 43 | 35.5 | |
| 6-10 years | 32 | 26.4 | |
| 11- 15 years | 16 | 13.2 | |
| 16- 20 years | 16 | 13.2 | |
| 21 years and more | 14 | 11.6 | |
| Working Time at the Current Workplace | | | |
| 3 years and less | 88 | 72.7 | |
| 4- 6 years | 21 | 17.4 | 3.24±3.940 (0.5-25) |
| 7- 9 years | 5 | 4.1 | |
| 10- 12 years | 3 | 2.5 | |
| 13 years and more | 4 | 3.3 | |

X̄= mean, Sd= standard deviation.

**Table 2.** Distribution of nurses' characteristics regarding VG injection (N=121)

| Characteristics of Nurses Regarding VG Injection | n | % |
|---|---|---|
| Status of Receiving Training for VG Injection | | |
| I received training | 74 | 61.2 |
| I didn't receive training | 47 | 38.8 |
| Where to Get Training for the VG Area | | |
| I received training at school | 72 | 59.5 |
| I received training in the hospital | 2 | 1.7 |
| VG Injection Application Status in the Unit Where Worked | | |
| I applied | 37 | 30.6 |
| I didn't apply | 84 | 69.4 |
| VG Injection Application Frequency (per week) | | |
| 1 | 22 | 59.5 |
| 2-3 | 15 | 40.5 |

There was no statistically significant difference between gender, education, working unit, working time at the current workplace and knowledge levels (P>0.05) (Table 4). The knowledge level of nurses regarding injection into the VG area according to their ages was compared using the Kruskal-Wallis H test. Kruskal-Wallis analysis was interpreted using the ranking averages and as a result of the analysis, it was determined that there was a significant difference between the ranking averages of the groups. H(2)/X2(2)=9.674, P=0.008. In line with the significant results, pairwise comparisons between the groups were made in accordance with Dunn's procedure using Bonferroni correction. The adjusted p value calculated with Bonferroni correction was taken into account. As a result of the post hoc analysis, it was determined that there was a statistically significant difference between the knowledge levels of those over the age of 40 (Mean Rank=45.97) and those under the age of 30 (Mean Rank=70.73) (P=0.022), no statistically significant difference was determined as a result of other pairwise comparisons (Table 4).

**Table 3.** Distribution of nurses' responses to propositions for VG injection (N=121)

| No | Propositions | Correct | | Wrong | | I don't know | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| 1 | Positioning the patient for injection in the VG area is easier than in other areas (dorsogluteal area). | 77 | 63.6 | 11 | 9.1 | 33 | 27.3 |
| 2 | VG area is used only in adults. | 25 | 20.7 | 56 | 46.3 | 40 | 33.1 |
| 3 | Irritating and oily solutions are not used in the VG area. | 30 | 24.8 | 41 | 33.9 | 50 | 41.3 |
| 4 | To identify the VG injection site, the nurse places the lower part of the palm on the greater thoracanter of the femur. | 74 | 61.2 | 4 | 3.3 | 43 | 35.5 |
| 5 | The gluteus medius muscle of the VG area is not sufficiently developed in infants (over 7 months). | 7 | 5.8 | 67 | 55.4 | 47 | 38.8 |
| 6 | VG area includes the gluteus medius and gluteus minimus muscles. | 52 | 43.0 | 8 | 6.6 | 61 | 50.4 |
| 7 | Since the VG area is far from the rectum, the risk of fecal contamination is low. | 80 | 66.1 | 6 | 5.0 | 35 | 28.9 |
| 8 | It cannot be used in patients with weak VG area. | 31 | 25.6 | 55 | 45.5 | 35 | 28.9 |
| 9 | After injection, massage of the injection area is recommended. | 76 | 62.8 | 10 | 8.3 | 35 | 28.9 |
| 10 | There are no injection-related complications such as nerve damage, tissue necrosis, or pain in the VG area. | 44 | 36.4 | 43 | 35.5 | 34 | 28.1 |
| 11 | If the left side hip is used, the left hand is used; if the right side hip is used, the right hand is used. | 36 | 29.8 | 43 | 35.5 | 42 | 34.7 |
| 12 | The VG area is the most reliable area. | 67 | 55.4 | 10 | 8.3 | 44 | 36.4 |
| 13 | Large volume muscles such as the VG area can accommodate up to 4 ml of medication. | 64 | 52.9 | 8 | 6.6 | 49 | 40.5 |
| 14 | I think I will harm the patient when injecting into the VG area. | 60 | 49.6 | 22 | 18.2 | 39 | 32.2 |
| 15 | Subcutaneous fat tissue is thicker in the VG area. | 33 | 27.3 | 35 | 28.9 | 53 | 43.8 |
| 16 | VG area detection is based on objective data. | 62 | 51.2 | 12 | 9.9 | 47 | 38.8 |

Mean correct score $\bar{X}\pm Sd$= 6.760±3.922 (Min- Max= 0- 14).

**Table 4.** The relationship between the descriptive characteristics of nurses and their characteristics regarding the VG injection and their knowledge levels (N=121)

| Variables | n | Knowledge Levels $\bar{X}\pm Sd$ | Test | P |
|---|---|---|---|---|
| Age | | | | |
| Aged 30 years below[1] | 59 | 7.91±3.349 | | |
| 30-40[2] | 43 | 5.97±4.137 | KW= 9.674 | 0.008* |
| Aged 40 above[3] | 19 | 4.94±4.142 | | |
| Bonferroni = 1>3 | | | | |
| Gender | | | | |
| Female | 106 | 6.88±3.993 | | |
| Male | 15 | 5.86±3.356 | Z= -1.390 | 0.165 |
| Education | | | | |
| Health vocational high school | 23 | 6.34±4.281 | | |
| Associate degree | 22 | 6.54±3.776 | KW= 0.775 | 0.856 |
| University | 68 | 7.01±3.975 | | |
| Higher education level | 8 | 6.37±3.248 | | |
| Working Unit | | | | |
| Inpatient unit | 95 | 6.60±4.090 | | |
| Intensive care unit | 26 | 7.34±3.236 | Z= -0.583 | 0.560 |

**Table 4.** The relationship between the descriptive characteristics of nurses and their characteristics regarding the VG injection and their knowledge levels (N=121) (continue)

| Variables | n | Knowledge Levels X̄±Sd | Test | P |
|---|---|---|---|---|
| Total Professional Working Time | | | | |
| 5 years and less | 43 | 8.04±3.387 | | |
| 6-10 years | 32 | 7.03±3.374 | KW= 11.070 | 0.026* |
| 11- 15 years | 16 | 4.81±4.214 | | |
| 16- 20 years | 16 | 6.56±4.689 | | |
| 21 years and more | 14 | 4.64±4.087 | | |
| Working Time at the Current Workplace | | | | |
| 3 years and less | 88 | 6.89±3.726 | | |
| 4- 6 years | 21 | 6.42±4.489 | | |
| 7- 9 years | 5 | 6.80±5.118 | KW=0.848 | 0.932 |
| 10- 12 years | 3 | 4.66±5.033 | | |
| 13 years and more | 4 | 7.00±4.546 | | |
| Status of Receiving Training for VG Injection | | | | |
| I received training | 74 | 8.54±2.891 | Z= -6.243 | 0.000* |
| I didn't receive training | 47 | 3.78±3.545 | | |
| VG Injection Application Status in the Unit Where Worked | | | | |
| I applied | 37 | 9.67±2.357 | Z= -5.433 | 0.000* |
| I didn't apply | 84 | 5.47±3.791 | | |
| VG Injection Application Frequency (per week) | | | | |
| 1 | 22 | 10.40±2.218 | Z= -2.241 | 0.025* |
| 2-3 | 15 | 8.60±2.197 | | |

*=P<0.05, Z= Mann Whitney U test,   KW= Kruskal-Wallis test.

**Table 5.** Correlation of nurses' descriptive characteristics and knowledge levels (N=121)

| Variables | Knowledge Levels | |
|---|---|---|
| | r | P |
| Age | -0.284 | 0.002* |
| Total Professional Working Time | -0.265 | 0.003* |
| Working Time at the Current Workplace | -0.035 | 0.703 |
| Status of Receiving Training for VG Injection | 0.045 | 0.620 |

*= P<0.05,  r= Spearman correlation analysis.

The nurses' knowledge level regarding injection into the VG area was compared according to their professional working hours using the Kruskal-Wallis H test. Kruskal-Wallis analysis was interpreted using the ranking averages and as a result of the analysis, it was determined that there was a significant difference between the ranking averages of the groups. H(4)/X2(4)=11.070, P=0.026. Post hoc analysis with Bonferroni correction was performed to determine which group caused the difference, but it could not be determined which group specifically caused this difference (Table 4).

A statistically significant difference was found between receiving training on VG area injection, performing VG injections in the unit they work in, and the frequency of weekly VG injections and their knowledge levels (P<0.05). It was determined that the knowledge levels of nurses who received training on VG area injection, applied VG injection in the unit they worked in, and performed VG injection once a week were higher than the others (P<0.05) (Table 4).

The relationship between nurses' descriptive characteristics and their knowledge levels was examined with Spearman correlation analysis. As a result of the analysis, there is a weakly negative, statistically significant linear relationship between age and knowledge level (r=-0.284, P=0.002). There is a weakly negative, statistically significant linear relationship between professional working time and knowledge level (r=-0.265, P=0.003) (Table 5) (Schober et al., 2018).

## 4. Discussion

In this descriptive and cross-sectional study, which was conducted to determine the knowledge levels of nurses working in a public hospital regarding VG area injection, 121 nurses were reached. The average age of nurses is 31.69±7.702, 48.8% are 30 years below, 35.5% are between 30-40 years and 15.7% are 40 years above, the majority are women (87.6%) and graduated (56.2%).

In Table 2, 61.2% of the nurses stated that they received training on VG area injection, 30.6% stated that they

perform VG area injection in the clinic where they work, and 59.5% stated that they do VG area injection once a week. In a study by Gülnar and Özveren (2016) evaluating the effect of training on the use of the ventrogluteal area in intramuscular injection, 7.4% of nurses used the ventrogluteal area before the training, and this rate increased to 34.6% after the training. In another study conducted by Sarı et al. (2017), the rate of nurses performing VG injections was 17.1%. In a study evaluating the effectiveness of training on nurses' knowledge of dorsogluteal and ventrogluteal region selection in intramuscular injection application and application frequency, the rate of those using the VG area before the training was 20%, while this rate increased to 68.6% after the training (Şanlıalp Zeyrek and Kuzu Kurban, 2017). This finding reveals the need for information regarding VG area use. It appears that most nurses do not perform VG site injections, contrary to what current literature suggests. It is thought that this may be due to nurses not being accustomed to using the VG area (Sarı et al., 2017; Sü and Bekmezci, 2020), not knowing how to determine the VG area (Arslan and Özden, 2018; Sü and Bekmezci, 2020), not having sufficient knowledge about the VG area (Arslan and Özden, 2018; Sü and Bekmezci, 2020), and patients not being accustomed to using the VG area (Sü and Bekmezci, 2020).

In this study, the correct mean of nurses' information suggestions regarding VG area injection was 6.760±3.92 and was found to be slightly lower than the medium level (Table 3). It seems that nurses' knowledge of VG area injection is limited. In Gülnar and Çalışkan (2014)'s study, the mean knowledge score of nurses was found to be at a medium level (13.1±3.7). In the study conducted by Şanlıalp Zeyrek and Kuzu Kurban (2017), it was found that the correct average of nurses was higher than our study. In addition, the average correct score of nurses increased after the training. In another study conducted by Sarı et al. (2017), unlike our study, the VG knowledge level was found to be slightly higher than the medium level, with the mean of correct answers from 24 questions being 14.37. In a study conducted by Yigit Gokbel and Sagkal Midilli (2021), it was found that the mean knowledge of nurses at the first follow-up before training was 45.57±18.502. In the follow-up after the training, it was determined that the mean knowledge of the nurses increased (85.13±7.157 in the second follow-up, and 79.37±6.239 in the third follow-up, and 76.53±5.588 in the fourth follow-up). Our finding may be due to the educational needs of nurses.

It was found that there was a statistically significant difference between the knowledge levels of those over 40 years of age (Mean Rank=45.97) and those under 30 years of age (Mean Rank=70.73) regarding VG area injection in our study (Table 4). As can be seen, the knowledge level of those under the age of 30 is higher than those over the age of 40. Likewise, in our study, it was determined that the knowledge level of nurses who

received training on VG area injection, applied VG injection in the department where they worked, and applied VG once a week was higher than the others (Table 4). Our research finding is supported by the study showing that the knowledge level of those who stated that they knew how to identify the IM injection site in the VG area and that they performed IM injection in the VG area was higher than others (Gülnar and Çalışkan, 2014). In another study, it was determined that the average number of injections made per week was 20.15, while the average injection made in the VG area was 1.54. It was also determined that nurses did not use the VG area for reasons such as not being used to the VG area (40%), not having enough knowledge (33%), and not knowing how to identify the exact area (31%) (Sü and Bekmezci, 2020). It is thought that as the level of knowledge about VG area injection increases, the frequency of VG area injection will also increase.

In this research, a weakly negative, statistically significant linear relationship was found between age, total professional working time and knowledge level (Table 5). As age and years of experience increase, the level of knowledge about the VG site injection decreases. This finding may be due to the fact that the trainings do not continue regularly and individuals forget and do not update the existing information. Therefore, this study highlights the importance of continuity in education.

This study contains some limitations. The sample size was limited, and only nurses working at one state hospital were included.

## 5. Conclusion

In conclusion, nurses' knowledge level regarding VG area injection was found to be slightly below the medium level. Regular in-service training on VG injection and evaluation of the training results will ensure that nurses have up-to-date knowledge. In addition, implementation and supervision of VG injection in clinics will expand the use of VG injection.

## Author Contributions

The percentage of the author(s) contributions is presented below. The author reviewed and approved the final version of the manuscript.

|  | N.B.E. |
|---|---|
| C | 100 |
| D | 100 |
| S | 100 |
| DCP | 100 |
| DAI | 100 |
| L | 100 |
| W | 100 |
| CR | 100 |
| SR | 100 |
| PM | 100 |
| FA | 100 |

C=Concept, D= design, S= supervision, DCP= data collection and/or processing, DAI= data analysis and/or interpretation, L= literature search, W= writing, CR= critical review, SR= submission and revision, PM= project management, FA= funding acquisition.

## Conflict of Interest

The author declared that there is no conflict of interest.

## Ethical Approval/Informed Consent

Approval for the research was received from Hitit University Non-Interventional Ethics Committee with the letter dated March 28, 2018 and numbered 2018-47. In addition, permission was obtained from the institution where the study was conducted. First, participants were informed and their consent was obtained. The research was conducted under with the Principles of the Declaration of Helsinki.

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