

Applying Intramuscular Injection to the Ventrogluteal Site; Is There a Difference Between the Two Hips in the Measurement of the Site?

Ventrogluteal Bölgeye İntramusküler Enjeksiyon Uygulama; Bölge Ölçümünde İki Kalça Arasında Fark Var mıdır?

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ABSTRACT Objective: It is known that gluteus medius and minimus muscle measures change according to gender and body mass index (BMI). It may differ anatomically between right and left sides. Accordingly the study was planned to investigate the differences between the right and left ventrogluteal (VG) regions according to the active and passive use of the individuals. **Material and Methods:** The study was planned in a descriptive, observational and cross-sectional manner to examine the anatomical structure of the VG site, as right and left. The study was performed on 93 healthy persons between the age of 18 and 35 years, who agreed to participate in the study. In the collection of the research data, the form including the indicative characteristics and the ultrasonographic measurement data of the individuals were used. **Results:** It was found that the differences of the gluteus medius in the right and left sides were statistically significant ($p<0.05$), when compared by gender there was a significant difference only in women ($p<0.05$), and there was a significant difference ($p=0.002$; $p=0.004$) with regard to BMI. When the correlation of the values measured according to BMI are examined, it was found that there was a high level of relationship and significant difference to the highest degree between the right and left VG site measurements in a positive way, in normal, mildly obese and obese individuals. **Conclusions:** It has been observed that there can be differences on the right or left side of the VG site. These differences also vary according to gender and BMI.

Keywords: Ventrogluteal site; muscle, bone; subcutaneous tissue; nursing practice

ÖZET Amaç: Gluteus medius ve minimus kas ölçülerinin cinsiyete ve beden kitle indeksine (BKİ) göre değiştiği bilinmektedir. Sağ ve sol tarafta da anatomik olarak farklılık gösterebilir. Bu doğrultuda çalışma bireylerin aktif ve pasif kullanımına göre sağ ve sol ventrogluteal (VG) bölgeler arasındaki farklılıkları araştırmak için planlandı. **Gereç ve Yöntemler:** Çalışma, VG bölgesinin, sağ ve sol olarak anatomik yapısının incelenmesi amacıyla gerçekleştirilen tanımlayıcı, gözlemsel ve kesitsel olarak planlandı. Çalışma 18-35 yaş arası sağlıklı ve araştırmaya katılmayı kabul eden 93 bireyde gerçekleştirildi. Araştırma verilerinin toplanmasında, bireylerin tanıtıcı özelliklerini içeren ve ultrasonografik ölçüm verilerinin olduğu form kullanıldı. **Bulgular:** Gluteus medius ve kemik uzunluklarının sağ ve sol bölge arasında farklılıklarının istatistiksel olarak anlamlı olduğu ($p<0,05$), cinsiyete göre karşılaştırıldığında sadece kadınlarda anlamlı olduğu ($p<0,05$), BKİ'ye göre anlamlı farklılık olduğu ($p=0,002$; $p=0,004$) görüldü. BKİ'ye göre ölçüm alınan değerlerin korelasyonuna bakıldığında, normal, hafif obez ve obez bireylerde sağ ve sol VG bölge ölçümü arasında pozitif yönde, yüksek düzeyde ilişki ve ileri derecede anlamlı fark olduğu görüldü. **Sonuç:** VG bölgede sağ veya sol tarafta farklılıkların olabileceği görülmüştür. Bu farklılıklar cinsiyete ve BKİ'ye göre de değişmektedir.

Anahtar Kelimeler: Ventrogluteal bölge; kas; kemik; subkutan doku; hemşirelik uygulaması

Intramuscular (IM) injection is an application that is frequently used in treatments to inject the medication deep into the muscle and it requires basic in-

formation and skill.¹ For the competence of safe IM injection, which is one of the responsibilities of nurses, besides the physiology and pharmacology

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knowledge, the anatomical structure of the site of injection should be known well, too. The VG site is recommended as the safest region for applying the IM injection.²⁻⁴ The most common complications are administering drugs to subcutaneous tissue by mistake, insufficient drug absorption, tissue irritations such as necrosis, hematoma, ecchymosis, vessel or nerve damage and pain, and all these complications can be prevented simply by choosing the ventrogluteal (VG) site as the injection site, which is a very safe option.⁴⁻⁵

Studies have shown that gluteus medius and minimus muscle measures change according to gender and body mass index (BMI). Variabilities can be observed in the measurements between the right and left VG sites according to active and passive use of individuals.⁵⁻⁸ Studies show that the development of injection complications are more common in males. The reason for this can be shown as the less amount of adipose tissue in males compared to females. In the elderly, the risk of developing injection neuropathy is increasing due to reduced muscle mass in cachectic men, especially due to bad care.^{1,9,10} In the studies including radiological measurements of the gluteal site muscles, it was stated that the fat rate in the dorsogluteal site (DG) was higher compared to the VG site, therefore injections with standard needles in the DG site were less effective than thought. It was found that gluteal fat thickness was greater in women.¹¹⁻¹⁴ According to BMI of the individuals, it was found that the method used in detection of the VG site was 100% reliable for all individuals with BMI between 18.5-29.9, whereas for individuals over 40 and above, the method was not 100% reliable. In studies comparing DG and VG, it was stated that BMI and the thickness of subcutaneous tissue and therefore the thickness of gluteus medius were changing and there was a significant difference between the sites.^{3,12} When the international and national literature are examined, it is seen that the studies are mainly aimed at comparing the reliability of the VG site, the pain after IM injection, and the advantages and disadvantages of the DG site and the VG site.

The study is planned to determine the gluteus medius and minimus muscle thicknesses in the VG

site recommended for IM injection, the distance between the greater trochanter of femur anterior superior iliac spine of the bone and whether there is a difference between the right and left hips with respect to subcutaneous tissue thickness.

MATERIAL AND METHODS

This study made in this direction is a descriptive and cross-sectional study conducted to investigate the structure of the VG site, which is used in IM injection application, anatomically on the right and left sides, the measurement difference between two sites and its effect on safe drug application.

THE STUDY QUESTIONS

- Is there a difference between the right and left gluteus medius muscle thickness of the VG site?
- Is there a difference between the right and left gluteus minimus muscle thickness of the VG site?
- Is there a difference between the measurements of the right and left bone spurs (the distance between the greater trochanter of femur - anterior superior iliac spine of the bone) of the VG site?
- Is there a difference between the right and left subcutaneous tissue thickness of the VG site?
- Is there a difference according to gender in the left and right parameters of VG site?
- Is there a difference according to BMI in the left and right parameters of VG site?

STUDY DESIGN

The study, which was planned as descriptive, observational and cross-sectional was performed between January-March 2017 on individuals who did not have a trauma affecting the gluteus medius and minimus muscles and walking disability, who are between the age of 18 and 35, and with BMI between 18.5 and 40.00. The number of samples was determined as 93 0.05 by power analysis at 0.80 power level, with a deviation of ± 0.05 at the error margin of 0.05. It was performed with healthy volunteer individuals determined by the randomized method, which complies with the research criteria.

ETHICAL CONSIDERATION

Before starting the research, permission was obtained from the Ethics Committee of Acıbadem University (ATADEK-2017/4, 2.3.2017). The purpose of the research and the expectations from them were explained to the healthy individuals constituting the research sample and the informed written consent was obtained for their participation in the research in the light of willingness and volunteering principle. The study was conducted in accordance with the principles of the Helsinki Declaration.

PROCEDURE

In the collection of research data; the data collection form prepared by the researchers in accordance with literature information was used. In the first part of the form, the gender, age and BMI data of the individuals were included. In the second part, records of separate measurements of the right and left sides were included. The side where the gluteus medius and minimus muscles used in the VG site calculation were the thickest, similarly the side where the subcutaneous tissue was the thickest and the distance between the femur trochanter and the crista iliaca anterior superior were displayed 7.5 MHz linear array transducer on Sonoline Elegra System USG device, which examines the organs and tissues of the human body, with high frequency sound waves via piezoelectric crystal probes, and the measurements were recorded. USG measurements were done by the radiologist researcher in a training and research hospital after work. The physician who performed the ultrasonography is the chief of radiology clinic of the education and research hospital of Sakarya University and has 15 years of clinical experience. The individuals were in the right and left lateral positions, their measurements were taken in radiology unit in the USG room. One researcher located the VG site using the V method and marked it with a "V" using a special pencil. Ultrasonography was used to determine the gluteus medius and gluteus minimus, subcutaneous tissue, any blood vessel or neural structure.

DATA ANALYSIS

The data obtained from the study was evaluated by transferring to the IBM SPSS Statistics 21 program.

The frequency distributions for categorical variables, and the minimum, maximum and arithmetic averages were given for evaluation of ordinal data. For the analysis of the data, their normal distributions were examined by using Kolmogorov-Smirnov test and it was seen that it did not show a normal distribution. In the advanced analysis, by using non-parametric tests, since the arithmetic mean of unsuitable parameters, mode and media are equal or close, and the skewness and kurtosis indices calculated by dividing the skewness and kurtosis coefficients by dividing their standard errors are close to 0 within the limits of ± 1.96 , the suitability of the normal distribution was evaluated as evidence and parametric tests were used.^{15,16} The correlation between numerical variables was assessed by Spearman correlation test, the effect sizes were calculated using the Cohen's d formula and the significance was considered as $p < 0.05$.

RESULTS

Of the individuals participating in the study, 47 (50.5%) were male and 46 (49.5%) were female, their average of age was 24.46 ± 3.66 years and their average of BMI was determined as 23.87 ± 3.91 kg/m². It was determined that while 61 (65.6%) of the individuals were in the range of 18.5-24.9, which is accepted as normal BMI, the other majority 21 (22.6%) were in the range of 25.0-29.9 which is accepted as overweight.

The waist and hip circumference measurements of the individuals were also taken in consideration of the importance of regional weight gain in IM application in the VG site. The average of waist circumference was 82.69 ± 12.21 centimeters, while the average of hip circumference was 102.10 ± 8.95 . When we look at the waist and hip ratio, the values obtained were as 0.77 ± 0.05 in females and 0.83 ± 0.09 in males.

The measurement average between the femur trochanter to anterior superior spine of crista iliaca bone, which was used in the detection of VG site of the individuals participated in the study, was found to be 99.45 ± 7.61 and 100.23 ± 6.64 millimeter on the right and left sides, respectively; the average of the

thickness of the gluteus minimus muscle was 11.87±2.41 milimeter and 11.74±3.17 milimeter on the right and left side, respectively; the distance average of the muscle from its deepest part to the bone was 63.57±6.00 milimeter and 63.52±6.32 milimeter on the right and left sides, respectively; and the average of the subcutaneous tissue thickness was 11.40±5.36 milimeter and 11.69±5.70 milimeter on the right and left sides, respectively. The thickness average of gluteus medius muscle, where the IM injection was applied, was 24.89±4.66 milimeter and 24.06 ±4.92 milimeter on the right and left sides, respectively (Table 1).

It was observed that there was a significant difference to the highest degree ($t=3.533$, $d=0.17$, $p=0.001$) between the measurement averages made between the gluteus medius muscles, between the right and left sides (Table 1).

When the average of the gluteus medius muscle of the individuals, where the VG application was performed, was examined according to the gender, it was measured 25.45±5.67 milimeter and 24.25±6.12 milimeter on the left and right sides of women, respectively; and in the statistical analysis performed, a significant difference was determined between the two hips ($t=3.127$, $d=0.20$, $p=0.003$) to the highest degree; also, a statistically significant difference was not determined between the measurements of the two hips of males, which were 24.34±3.36 milimeter and

23.87±3.41 milimeter, respectively ($t=1.750$, $d=0.13$, $p=0.087$) (Table 2).

It was found that 3.2% of the individuals were thin, 61 (65.6%) were normal weight, 21 (22.6) were mildly obese and 8 (8.6) were obese. When the average of gluteus medius muscle, to where the VG application was performed, was examined according to the BMI, it was measured 20.20±1.77 milimeter and 18.53±1.78 milimeter on the right and left sides, respectively, in the low BMI group; 24.07±4.19 milimeter and 23.34±4.63 milimeter on the right and left sides, respectively, in the normal BMI group; 36.30±4.15 milimeter and 25.27±4.27 milimeter on the right and left sides, respectively, in the mildly obese BMI group; and 29.21±6.47 milimeter and 28.41±6.11 milimeter on the right and left sides, respectively, in the obese BMI group. It was determined that there was a statistically significant difference ($F=5.188$; $p=0.002$) ($F=4.714$, $p=0.004$) in the average of gluteus medius muscle between the right and left sides, in the thin, normal and mildly obese group, and the difference was noticeable in the overweight group (Table 3).

In the case that the BMI was numerical, the correlation of gluteus medius, bone spurs, distance to the bone and subcutaneous tissue thickness in the right and left sides were also examined separately by performing nonparametric Spearman correlation test. In the individuals with low BMI, it was ob-

TABLE 1: Distance between the bone spurs in the right and left hips, gluteus medius, minimus muscles, distance from the deepest part of the muscle to the bone and subcutaneous tissue evaluation (n=93).

	Right $\bar{X} \pm SS$ (Minimum-Maximum)	Left $\bar{X} \pm SS$ (Minimum-Maximum)	t;p
Distance between bone spurs (osteophyte)	99.45±7.61 (65.70-117.80)	100.23±6.64 (87.60-117.00)	$t=-1.775$; 0.079
Gluteus medius	24.89±4.66 (17.20-40.80)	24.06±4.92 (15.50-39.20)	$t=3.533$; 0.001
Gluteus minimus	11.87±2.41 (17.90-7.20)	11.74±3.17 (6.50-30.50)	$t=0.458$; 0.648
Distance from the deepest part of the muscle to the bone	63.57±6.00 (51.20-82.80)	63.52±6.32 (52.50-81.60)	$t=0.063$; 0.950
Subcutaneous tissue	11.40±5.36 (3.60-28.20)	11.69±5.70 (3.70-32.70)	$t=-1.462$; 0.147

t;Paired t test; SS: Standard deviation.

TABLE 2: Evaluation of the measurements of the gluteus medius muscle according to gender.

	n (%)	Right gluteus medius	Left gluteus medius	t; p
		X±SS	X±SS	
Gender	93			
Female	46 (49.5)	25.45±5.67	24.25±6.12	t=3.127; 0.003
Male	47 (50.5)	24.34±3.36	23.87±3.41	t=1.750; 0.087

t; Paired t test; SS: Standard deviation.

TABLE 3: Evaluation of the measurements of the gluteus medius muscle according to body mass index (n=93).

	n (%)	Right gluteus medius	Left gluteus medius	t; pld
		X±SS	X±SS	
BMI	93			
<18.5*	3 (3.2)	20.20±1.77	18.53±1.78	t=3.221*; 0.084
18.5-24.9**	61 (65.6)	24.07±4.19	23.34±4.63	t=2.322*; 0.024
25.0-29.9***	21 (22.6)	26.30±4.15	25.27±4.27	t=2.465*; 0.023
30.0-39.9****	8 (8.6)	29.21±6.47	28.41±6.11	t=1.007*; 0.347
F; p		F=5.188**; 0.002 ***(-1.4, 2.4)	F=4.714**; 0.004 ***(-1.4, 2.4)	

t; Paired t test, **F; ANOVA, ***Bonferonni test.

* Thin: <18.5 ** Normal: 18-24.9 *** Slightly Overweight: 25-29.9 **** Obese: 30 and above

BMI: Body mass index; SS: Standard deviation.

served that while there was a high positive correlation, between the gluteus medius and the distance of the muscle to the bone, between the right and left measurements, it was not significant; and there was a negative correlation in the subcutaneous tissue, but was not statistically significant. In moderate, mildly obese and obese individuals, it was observed that the gluteus medius, bone spurs, distance of the

muscle to the bone and subcutaneous tissue thickness caused a statistically significant positive correlation between the right and left sides, and created a significant difference to the highest degree. It was determined that as the BMI increased, the muscle thickness between right and left sides and the difference of other measurement parameters also increased (p<0.001) (Table 4).

TABLE 4: Correlation of ventrogluteal measurement sizes according to body mass index (n=93).

BMI	Gluteus medius	Distance of bone spurs	Distance of muscle to the bone	Subcutaneous tissue
X±SS	Right\Left	Right\Left	Right\Left	Right\Left
23.87±3.91	r; p	r; p	r; p	r; p
<18.5*	0.87; 0.323	0.03; 0.977	0.87; 0.322	-0.99; 0.080
18.5-24.9**	0.84; <0.001	0.69; <0.001	0.88; <0.001	0.92; <0.001
25.0-29.9***	0.89; <0.001	0.89; <0.001	0.93; <0.001	0.94; <0.001
30.0-39.9****	0.93; 0.001	0.97; <0.001	0.92; 0.001	0.92; <0.001

r: Pearson correlation

* Thin: <18.5 ** Normal: 18-24.9 *** Slightly Overweight: 25-29.9 **** Obese: 30 and above

BMI: Body mass index; SS: Standard deviation.

DISCUSSION

Evidence-based studies recommend that the VG site should be the first choice in the skill for intramuscular drug application frequently used by nurses.^{17,18} However, there is a significant gap in the training and application process of the mentioned injection site, because it is not used actively.¹⁹ In the studies, nurses stated that among the reasons for not preferring the site was the difficulty in determining the site.^{4,20,21} Also, in the studies in which the safety of the injection site has been investigated, it was concluded that the gender or differences arising from the BMI could create this situation.^{3,12} Another view is that there may be differences between the right and left sides, but the number of studies revealing these differences is rather few. For this reason, all the differences obtained from the study, which we think will make great contribution to the literature, will be tried to be discussed in detail.

Muscles located in the VG site are; gluteus medius and gluteus minimus. For intramuscular drug application skills, it is known that these muscles are widely distributed in the VG site and are in sufficient thickness.^{12,23} In the study conducted by Coskun, Kilic & Senture; while it was reported that the average of gluteus medius muscle in the right VG site was 23.17 ± 6.21 mm and it was 22.22 ± 5.84 mm on the left side and a significant difference was not found; they found that there was a significant difference between the distance of right and left sides to the vein and artery, and the left side was the farther.⁸

For this reason, it is recommended that the physical properties of the individual should be evaluated in the application of intramuscular drug. It is seen that the most important cause of this result is the BMI. It is indicated that as the BMI increased, the gluteus medius and minimus muscle thicknesses in subcutaneous tissue and VG site increased and their distance to the nerves was affected.^{8,12,24,25} In another study, in the comparison of two groups as BMI < 21 kg/m² and ≥ 21 kg/m², it was reported that epidermis and gluteus medius muscle distance was significantly different between the right and left side, epidermis and osteophyte created a sig-

nificant difference to the highest degree and as the BMI increased the correlation between the measurement sizes were observed.⁶ Masuda et al. unlike the finding of this study, found that the distance between the epidermis and the muscle in the VG did not create a difference in the right and left sides.²⁶ In the study, it was observed that while the average of gluteus medius muscles located in the VG site was determined as 24.89 ± 4.66 mm on the right and as 24.06 ± 4.92 mm on the left, it created a statistically significant difference in the normal and mildly obese group (Table 1). It should be taken into consideration that with the BMI factor, especially the average of the gluteus medius muscles can be at different ratios in the right and left VG sites. According to the result of the study, it can be said that such a situation is not in question in the average of gluteus minimus muscle thickness (Table 1).

In the study performed by Güneş et al. in order to examine the reliability of the method used in determining the side, the subcutaneous tissue thickness in the VG site was found as 28.0 ± 14.8 mm in females and as 20.6 ± 8.4 mm in males.¹² A similar situation with the literature is also mentioned in the study. In the study conducted by Zaybak et al. in order to determine the needle length that should be preferred in obese individuals; the subcutaneous tissue thickness was measured as 54.2 ± 15.5 mm in females and as 36.4 ± 10.5 mm in males. It has been reported that the IM injection success rate was higher in males compared to females due to the fact that the subcutaneous tissue thickness in males was low.²² In addition, the average of subcutaneous tissue thickness in the VG site investigated specific to study was obtained as 11.40 ± 5.36 mm in the right side, and as 11.69 ± 5.70 mm in the left side; and it was seen that there was no significant difference between the two sides with regard to subcutaneous tissue differences (Table 1). Similar to our study, Coskun, Kilic & Senture and Greenway also emphasized that there was no difference between the muscle and subcutaneous measurements, on the right and left VG sites, the ratio of subcutaneous tissue was low, and it was distant from the gluteal ven, arterial and neural structures.^{8,23} Therefore, the VG site can be easily preferred for in-

intramuscular drug application with regard to right and left sides. Only, it should be taken into consideration that subcutaneous tissue thicknesses can be excessive in female or obese individuals.

Another reason for defining the VG site as the safest side and for supporting it by studies is its distance to the nerves.^{8,27} Coskun and colleagues indicated that the distance of the injection site to the artery in the VG site was 13.87 ± 16 mm, and its distance to the nerve was 11.82 ± 14 mm, and it was 6.83 ± 9 mm and 5.67 ± 9 mm, respectively, in the DG site. The ancillary means in determining this distance in the VG site is the bone spurs which also facilitate the detection of this site, doubles the safety of the side compared to the DG site. There are not many studies in the literature that investigate the difference of the ratios of these bone spurs between the right and left sides. Masuda et al. indicated that the distance between the epidermis layer and the osteophyte differed according to the BMI, and that it created differences in the right and left sides, and Sakamaki et al. also obtained similar results.^{6,26} In the study, the distance between the greater trochanter and the crista iliaca anterior superior iliac spine was 99.45 ± 7.61 mm in the right side and 100.23 ± 6.64 mm in the left side (Table 1).

In the study of Kaya et al. investigating the reliability of two different methods used in detection of VG sites; the average of gluteus medius muscle thickness according to gender was measured as 24.67 ± 7.77 mm in females and as 24.90 ± 7.11 mm in males.³ In another study, it was reported that although the average of muscle thickness in the VG site was not significant according to gender, it was greater in males compared to females due to their muscle masses.¹² In the study, unlike the literature, the average of gluteus medius muscle according to gender was determined as 25.45 ± 5.67 mm and 24.25 ± 6.12 mm in the right and left sides, respectively, in females. In males, these ratios were measured as 24.34 ± 3.36 mm on the right and as 23.87 ± 3.41 mm on the left, respectively (Table 2). As a result of the statistical analysis, it was concluded that there was a statistically significant difference between two hips both in females and females had more muscle mass

compared to males. It is thought that this situation is due to the fact that individuals with different BMI ratios come together. However, studies indicate that the BMI factor should be taken into consideration in the skill for intramuscular drug application. Because in this study, it was observed that as the BMI rates increased, all other measurement parameters, including the muscle thickness, increased (Table 3, Table 4). It is known that the development of subcutaneous tissue and fat tissue changes according to gender and race, and the development of muscle is also affected depending on the subcutaneous and adipose tissue.^{6,26} While the muscle tissue was more on the surface 22.22 ± 5 mm depending on the fewness of subcutaneous tissue (<3.75 cm) in the VG site, the subcutaneous tissue was more (1-9 cm) in the DG site and the muscle tissue was deeper and the muscle thickness was 28.35 ± 7 mm.²³ Therefore we think that it will increase the rates of safely drug application if the healthcare personnel reevaluate their skills in this regard, avoid the standard protocols and have individual-specific attitude.

It has been determined that these ratios increase according to BMI as in other parameters (Table 4). For this reason, there may be regional differences in application of the injection, so the insertion angle and the length of the injection needle have to be evaluated separately in the right and left sides. When injecting the IM, the body structure of the individual, the subcutaneous tissue thickness, the palpation of the injection site, the angle of the site to the articular and its depth should be considered. When applying to the VG area, it is important that the individual is evaluated and thought critically.

CONCLUSION

As a result, in the study, it has been observed that there may be differences in the right or left side of the VG site. It was also seen that all parameters changed as the BMI increased. There is a need for more randomized controlled studies to be performed with large groups to be able to make precise inferences. The risk that the needle might not reach the muscle mass even when IM is administered to the VG site remains, and the BMI is the most important indicative of factor of

this risk. For this reason, an individual's sex and BMI should be considered in the IM injection management to the VG site. We believe that the results of the study, will contribute to the literature in terms of enabling the healthcare personel to maintain healthy drug applications and provide effective care for individuals, will be the starting point and will be a basis for the studies. Additionally, VG site right-left difference should be included as a course in nurse or in-service education programs.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Özlem Doğu Kökcü, Işık Atasoy; **Design:** Özlem Doğu Kökcü, Işık Atasoy; **Control/Supervision:** Ükke Karabacak, Ela Yılmaz Coşkun, Özlem Doğu Kökcü; **Data Collection and/or Processing:** Özlem Doğu Kökcü, Işık Atasoy, Alper Karacan; **Analysis and/or Interpretation:** Ükke Karabacak, Alper Karacan; **Literature Review:** Özlem Doğu Kökcü, Işık Atasoy, Ela Yılmaz Coşkun; **Writing the Article:** Özlem Doğu Kökcü, Ela Yılmaz Coşkun; **Critical Review:** Ükke Karabacak, Alper Karacan; **References and Fundings:** Özlem Doğu Kökcü, Işık Atasoy; **Materials:** Özlem Doğu Kökcü, Işık Atasoy.

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