



## Description of gender, intravenous drug administration, and QT interval view at dr. Wahidin general hospital sudirohusodo Makassar

Suradi Efendi<sup>1\*)</sup>, Nour Sriyanah<sup>1</sup>, Ayu Sri Wahyuni<sup>2</sup>, Nurnainah<sup>3</sup>, Fitriani<sup>1</sup>, Nur Wahyuni Arif<sup>4</sup>

<sup>1\*)</sup> Sekolah Tinggi Ilmu Kesehatan Makassar

<sup>2</sup> Institut Kesehatan dan Bisnis St. Fatimah Mamuju

### ARTICLE INFO

#### Article history:

Received 21 January 2023

Accepted 1 April 2023

Published 10 June 2023

#### Keyword:

Gender  
Drug Administration  
QT Interval Prolongation

### ABSTRACT

The QT interval is a picture of the activity of the heart's ventricles, starting from depolarization to ventricular repolarization which can be influenced by several factors, namely drugs, gender, inflammatory conditions, obesity, heart failure, and others. Basic Health Research Data in 2018, states that in Indonesia there are around 2,784,064 individuals who suffer from heart disease and every year this number will continue to increase. The purpose of this study was to find out whether there was a relationship between sex and intravenous administration of drugs with QT prolongation. This research is a type of descriptive research. With a total sample of 118 respondents, it was carried out by observing medical records. The results of statistical tests on the sex variable with QT prolongation showed  $\rho = 0.007$ , and on the intravenous drug administration variable with QT prolongation showed  $\rho = 0.002$ . The conclusion of this study was that there was a relationship between gender and intravenous drug administration with QT prolongation. It is necessary to pay attention to the side effects of drug administration given to patients. And for future researchers, it is hoped that this study can become a reference by using other variables related to QT interval prolongation such as drug side effects and conditions of electrolyte disturbances

### Kata kunci:

Jenis Kelamin  
Pemberian Obat  
Pemanjangan Interval QT

#### \*) corresponding author

Suradi Efendi

Sekolah Tinggi Ilmu Kesehatan Makassar  
Jl.Maccini Raya N0.197 Makassar, 90231  
Sulawesi Selatan

Email: atolnurse@gmail.com

DOI: 10.30604/jika.v8i2.1912  
Copyright 2023 @author(s)

### ABSTRAK

Interval QT merupakan gambaran aktivitas ventrikel jantung, dimulai dari depolarisasi hingga repolarisasi ventrikel yang dapat dipengaruhi oleh beberapa faktor yaitu obat-obatan, jenis kelamin, kondisi inflamasi, obesitas, gagal jantung, dan lainnya. Data Riset Kesehatan Dasar pada tahun 2018, menyatakan di Indonesia terdapat sekitar 2.784.064 individu yang menderita penyakit jantung dan setiap tahunnya angka tersebut akan terus meningkat. Tujuan penelitian ini mencari tahu adakah hubungan jenis kelamin dan pemberian obat melalui intravena dengan pemanjangan interval QT. Penelitian ini merupakan jenis penelitian deskriptif. Dengan jumlah sampel sebanyak 118 responden yang dilakukan dengan cara observasi rekam medik. Hasil uji statistik pada variabel jenis kelamin dengan pemanjangan interval QT menunjukkan  $\rho=0,007$ , dan pada variabel pemberian obat melalui intravena dengan pemanjangan interval QT menunjukkan  $\rho=0,002$ . Simpulan penelitian ini terdapat hubungan antara jenis kelamin dan pemberian obat melalui intravena dengan pemanjangan interval QT. Perlu diberikan perhatian terhadap efek samping dari pemberian obat yang diberikan kepada pasien. Dan untuk peneliti berikutnya diharapkan studi ini dapat menjadi acuan dengan menggunakan variabel lain terkait pemanjangan interval QT seperti efek samping obat dan kondisi gangguan keseimbangan elektrolit.

This open access article is under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.



## INTRODUCTION

The QT interval is a measure of activity in both ventricles of the heart, starting from depolarization to ventricular repolarization. The QT interval is measured from the beginning of the QRS complex to the end of the T wave. The duration of the normal QT interval is based on heart rate, so the value of the QT interval will decrease if there is an increase in heart rate and vice versa (Yofrido, Christine and Harjana. 2018). The QT interval is said to be prolonged if it reaches more than 460 ms in women and more than 450 ms in men, according to recommendations from the American College of Cardiology (ACC), the American Heart Association (AHA), and other professional organizations (Mirvis and Goldberger, 2015).

Several factors affect QT interval prolongation, namely drugs, female gender, inflammatory conditions, heart failure, obesity, conditions of electrolyte disturbances such as hypokalemia, hypocalcemia, hypomagnesemia, hypothyroidism, and other conditions (Mirvis and Goldberger, 2015; Antoniou et al. al., 2017). In the opinion (Gowd and Thompson, 2012) gender affects electrophysiological properties and cardiac arrhythmias. Women have higher resting heart rates, shorter PR and longer QT intervals in a study conducted by Mayuga et al., (2001). According to Peter and Woosley, (2016) one of the most common causes of QT prolongation is the use of certain drugs. This was also proven in the study of Novita and Destiani, (2019) which stated that various types of drugs have interactions with QT interval prolongation.

QT prolongation can be an important risk factor for ventricular arrhythmias and sudden arrest (Mansur, et al., 2021). QT prolongation has also been considered as a marker of the arrhythmogenic potential of certain drugs associated with an increased risk of ventricular "Torsade de Pointes" (TdP) tachyarrhythmias leading to sudden cardiac arrest. In the United States, 90% of deaths are caused by cardiac arrest (AHA, 2020). Meanwhile, in Indonesia, there is no specific statistical data related to cardiac arrest cases so far.

In 2016 according to WHO data there were as many as 17.9 million people who die each year due to cardiovascular disease. Then in 2018 according to Riskesdas data, the prevalence of coronary heart disease in Indonesia reached 1.5% or it could be said that 15 out of 1000 Indonesians suffer from coronary heart disease. For the heart disease referral center hospital in Eastern Indonesia, namely RSUP Dr. Wahidin Sudirohusodo coronary heart disease is included in the top 20 diseases with the most outpatient and inpatient care. Cases of cardiac arrest are also among the most common emergency treatment cases at RSUP Dr. Wahidin Sudirohusodo. In this study an analysis will be carried out to describe the incidence of QT prolongation based on gender and intravenous drug administration.

## RESEARCH METHODS

This research is quantitative research with descriptive analysis research type. The research was conducted in the CVCU room of RSUP Dr. Wahidin Sudirohusodo Makassar during the period August-September 2022. The research subjects were patients who had been treated in the CVCU room of RSUP Dr. Wahidin Sudirohusodo Makassar for the period January 2021 to August 2022 by fulfilling the inclusion criteria, namely having complete EKG examination data and being given intravenous drug therapy. Sampling

was carried out by purposive sampling with a total of 118 samples obtained by observing medical records. The data were processed using descriptive statistics and presented in tabular form.

## RESULTS AND DISCUSSION

In this study there were 133 patients treated in the CVCU room of RSUP Dr. Wahidin Sudirohusodo Makassar, but only 118 samples met the inclusion criteria. The other 15 samples included exclusion criteria including incomplete medical record data in the form of ECG examination data and other demographic data and medical record data being used for treatment purposes.

**Table 1.**  
**Frequency Distribution Based on Variable Characteristics at RSUP Dr. Wahidin Sudirohusodo Makassar Period January 2021 - August 2022**

Variable	n	%
<b>Gender</b>		
Woman	35	29,7
Man	83	70,3
<b>Drug administration</b>		
≥ 2 types of medicine	94	79,7
1 type of medicine	24	20,3
<b>QT Interval Value</b>		
QT prolongation occurs	60	50,8
No QT Prolongation Occurs	58	49,2
<b>Total</b>	<b>118</b>	<b>100,0</b>

Source: Primary Data 2022

In table 1 it can be seen that of the 118 samples (100.0%) in the gender variable, namely 35 female samples (29.7%) and 83 male samples (70.3%). In the variable administration of drugs via intravenous, namely administration of ≥ 2 types of drugs as many as 94 samples (79.7%) and administration of 1 type of drug as many as 24 samples (20.3%). And for the variable QT interval value, there was a QT interval prolongation in 60 samples (50.8%) and there was no QT interval prolongation in 58 samples (49.2%).

### Gender

Based on the research results obtained, out of 118 samples there were 35 samples (29.7%) who were female and 83 samples (70.3%) who were male. Compared to women, men tend to be more often affected by coronary heart disease (CHD). Because women have protection against triggers for atherosclerosis, namely the hormone estrogen, which has an important role in preventing damage to blood vessels. But women can also be at risk for coronary heart disease (CHD) if they have entered menopause due to decreased production of the hormone estrogen. This is also in line with the opinion of Maulana, (2016) that for men when they reach the age of 45 they are at high risk of developing coronary heart disease. Meanwhile, women at the age of 55 or at the time of menopause will experience an increased risk of heart disease.

Based on the research results obtained and the existing theory, researchers are of the opinion that those who have a greater risk of coronary heart disease are men than women. Because before entering menopause every woman has an estrogen hormone which is said to be a natural protector for women against heart disease. Where the hormone estrogen

can control cholesterol in the blood, especially HDL (high density lipoprotein) which functions to clean fatty plaques that stick to the walls of the coronary arteries so that the heart can avoid coronary heart disease. But both men and women will be at risk of developing coronary heart disease if they don't live a healthy lifestyle. and regarding the sex difference in the QT interval is not visible from birth, but the difference will be seen after entering puberty. The changes in the QT interval seen after puberty may be due to changes in sex hormones. Testosterone and progesterone in males tend to shorten the QT interval while estrogen in females tends to prolong the QT interval. Complicating the interpretation of these hormonal effects throughout life are the variations in the estrogen/progesterone ratio and the additional QT prolonging effect of FSH (Abehsira et al., 2016).

Therefore, sex-related differences in the QT interval are most likely the result of sex-specific hormonal changes. Although the exact mechanism and pathophysiology of sex hormones on the QT interval is unknown, testosterone appears to shorten the QT interval in males. And in women there is a more complex interaction between progesterone and estrogen due to the influence of the menstrual cycle, pregnancy and menopause (Vink et al., 2018).

Similar to the results of research conducted by Fadlilah, Sucipto and Amestiasih, (2019) regarding gender, age, BMI and smoking habits associated with the risk of cardiovascular disease which states that groups that tend to have a greater risk of experiencing cardiovascular disease are men because they are associated with an unhealthy lifestyle such as smoking and consuming alcoholic beverages compared to women.

Therefore it is necessary to do self-care to prevent or reduce the risk of disease. Self-care needs are influenced by several internal causes, namely the individual himself, and external causes, namely the people around him. (Efendi Suradi et al., 2022). The support of people around this may consist of providing information or teaching a skill that can provide a solution to a problem as well as assessment support, namely providing information that can shape individuals in evaluating personal performances. This support is in the form of providing information, guidance so that they can live a healthier life (Sriyanah et al., 2022).

### Drug Administration Through Intravenous

Based on the research results obtained, out of 118 respondents, 94 respondents (79.7%) were given  $\geq 2$  types of drugs and 24 respondents (20.3%) were given 1 type of drug. Administering drugs intravenously with  $\geq 2$  types of drugs is more than the administration of drugs intravenously alone or only given 1 type of drug. This is similar to the research conducted by Novita and Destiani, (2019), namely several studies regarding drug administration related to lengthening the average interval given combination drugs or  $\geq 2$  types of drugs.

Based on the research results obtained and the existing theory, researchers are of the opinion that administration of combination drugs  $\geq 2$  types of drugs through intravenously has more potential for QT interval prolongation. Therefore, the risk of drug-induced QT prolongation is directly related to the dose and plasma drug concentration. Pharmacokinetic and pharmacodynamic interactions can also lead to QT prolongation (Moss et al., 1991). And in the opinion of Paulussen et al., (2004) combination drug interactions that inhibit drug metabolism can increase the plasma concentration of the affected drug and trigger QT interval prolongation. Likewise, QT prolongation can occur when two

drugs are addictive. But individual susceptibility to QT prolongation varies.

### QT interval prolongation

Based on the research results obtained, out of 118 respondents there were 60 respondents (50.8%) who had QT interval prolongation while 58 respondents (49.2%) did not have QT prolongation. QT prolongation can be influenced by several factors caused by drugs, female gender, inflammatory conditions, obesity, heart failure, hypokalemia, hypocalcemia, hypomagnesemia, hypothyroidism, and others (Mirvis and Goldberger, 2015; Antoniou et al., 2017).

Based on the research results obtained and existing theory, the researchers argue that the factors that influence the incidence of QT interval prolongation in this study are gender, drug administration, electrolyte balance disorders and disease complications suffered by respondents. Research conducted by Mayuga et al., (2001) is also in line with the results of this study, namely gender and age have an effect on increasing QT interval lengthening, namely women have a longer QT than men and older people have a longer QT interval than young people.

The other causes of QT prolongation are related to electrolyte balance disturbances (hypokalemia, hypocalcemia and hypomagnesemia) which occurred in several respondents in this study. Disturbances in electrolyte balance can lead to prolongation of the QT interval in accordance with the opinion of Castiglione and Odening, (2020), that several electrolyte disturbances such as hypokalemia, hypocalcemia and hypomagnesemia can greatly affect repolarization and at the same time increase the risk of initial depolarization and thus can cause torsade de pointes (TdP) or sudden cardiac death.

### CONCLUSION

Men have a greater risk of coronary heart disease than women because it is influenced by hormonal factors and is also associated with unhealthy lifestyles such as smoking and consuming alcoholic beverages more often in men than women. Associated with the administration of combination drugs  $\geq 2$  types of drugs intravenously has more potential for QT interval prolongation. Therefore, the risk of drug-induced QT prolongation is directly related to the dose and plasma drug concentration. As well as related to QT prolongation there are several factors that influence the incidence of QT prolongation in this study, namely gender, drug administration, electrolyte balance disorders and disease complications suffered by respondents.

### REFERENCES

- Abehsira, G. et al. (2016) 'Complex influence of gonadotropins and sex steroid hormones on QT interval duration', *Journal of Clinical Endocrinology and Metabolism*, 101(7), pp. 2776–2784. Available at: <https://doi.org/10.1210/jc.2016-1877>.
- Antoniou, C.K. et al. (2017) 'QT prolongation and malignant arrhythmia: How serious a problem?', *European Cardiology Review*, 12(2), pp. 112–120. Available at: <https://doi.org/10.15420/ocr.2017:16:1>.
- Castiglione, A. and Odening, K. (2020) *QT-Zeit-Was fange ich eigentlich damit an?* Available at: [www.crediblemeds.org](http://www.crediblemeds.org).

- Efendi Suradi *et al.* (2022) 'SELF-CARE IN THE ELDERLY WITH HYPERTENSION', *Proceedings of the International Conference on Nursing and Health Sciences*. Frontiers Media S.A. Available at: <https://doi.org/10.3389/fcvm.2020.00049>.
- Fadlilah, S., Sucipto, A. and Amestiasih, T. (2019) 'USIA, JENIS KELAMIN, PERILAKU MEROKOK, DAN IMT BERHUBUNGAN DENGAN RESIKO PENYAKIT KARDIOVASKULER', *Jurnal Keperawatan LPPM Sekolah Tinggi Ilmu Kesehatan Kendal*, 11, pp. 261–268.
- Gowd, B.M.P. and Thompson, P.D. (2012) 'Effect of female sex on cardiac arrhythmias', *Cardiology in Review*, pp. 297–303. Available at: <https://doi.org/10.1097/CRD.0b013e318259294b>.
- Mansur, M. *et al.* (2021) 'Gambaran Pemanjangan Interval QTc Pada Terapi Jangka Pendek Pasien TB MDR', *JURNAL MEDIA KESEHATAN*, 14, pp. 08–17.
- Maulana, M. (2016) *Penyakit Jantung - Pengertian, Penanganan dan Pengobatan*. Edited by A.Q. Shaleh. Yogyakarta: KATAHATI.
- Mayuga, K.A. *et al.* (2001) 'Effects of Age and Gender on the QT Response to Exercise', *The American Journal of Cardiology*, 87.
- Mirvis, D.M. and Goldberger, A.L. (2015) 'Electrocardiography. In Mann DL, Zipes DP, Libby P, Bonow RO, editors. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine', *Philadelphia: Elsevier*, pp. 144–154.
- Moss, A.J. *et al.* (1991) *The Long QT Syndrome Prospective Longitudinal Study of 328 Families Background. The Long QT Syndrome (LQTS) is an infrequently occurring familial disorder in which affected individuals have electrocardiographic QT interval prolongation and a*. *Circulation*. Available at: <http://circ.ahajournals.org/>.
- Novita, N.F. and Destiani, D.P. (2019) *Interaksi Obat Terhadap Perpanjangan Interval QT*. Farmaka.
- Paulussen, A.D.C. *et al.* (2004) 'Genetic variations of HCNQ1, KCNH2, SCN5A, KCNE1, and KCNE2 in drug-induced long QT syndrome patients', *Journal of Molecular Medicine*, 82(3), pp. 182–188. Available at: <https://doi.org/10.1007/s00109-003-0522-z>.
- Peter J. Schwartz and Raymond L. Woosley (2016) *Predicting the Unpredictable Drug-Induced QT Prolongation and Torsades de Pointes* STUDY. JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY.
- Sriyanah, N. *et al.* (2022) 'Hubungan Pengetahuan, Sikap dengan Dukungan Keluarga sebagai Pengawas Kepatuhan Minum Obat Penderita Tuberkulosis Paru', *An Idea Health Journal* [Preprint].
- Vink, A.S. *et al.* (2018) 'Effect of age and gender on the QTc-interval in healthy individuals and patients with long-QT syndrome', *Trends in Cardiovascular Medicine*. Elsevier Inc., pp. 64–75. Available at: <https://doi.org/10.1016/j.tcm.2017.07.012>.
- Yofrido, F.M., Christine, I. and Harjana, L.T. (2018) *Pemanjangan Interval QT Terkoreksi (QTc) Pada Pasien Hipokalemia Berat Dengan Penyulit Aritmia Ventrikel Fatal*.