The relationship between serum potassium concentrations and electrocardiographic characteristics in 163,547 individuals from primary care

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Published in:
Book of abstracts from ESC Congress 2019

Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

Abstract: **P6562**

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Topic(s):
Arrhythmias, General – Prevention

Citation:

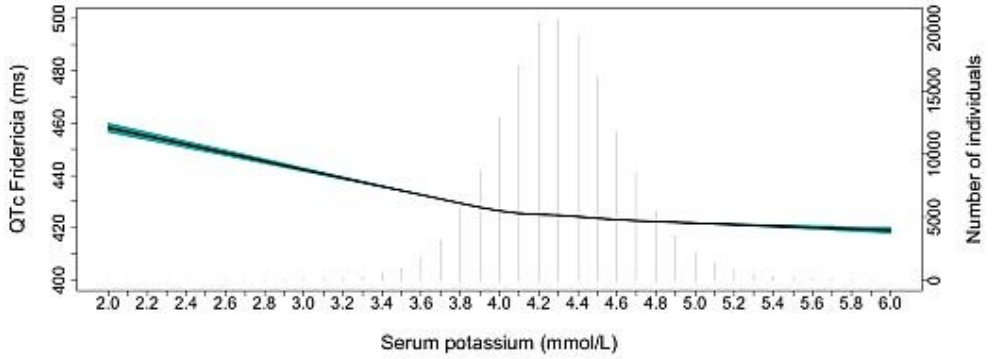
Funding Acknowledgements:
None

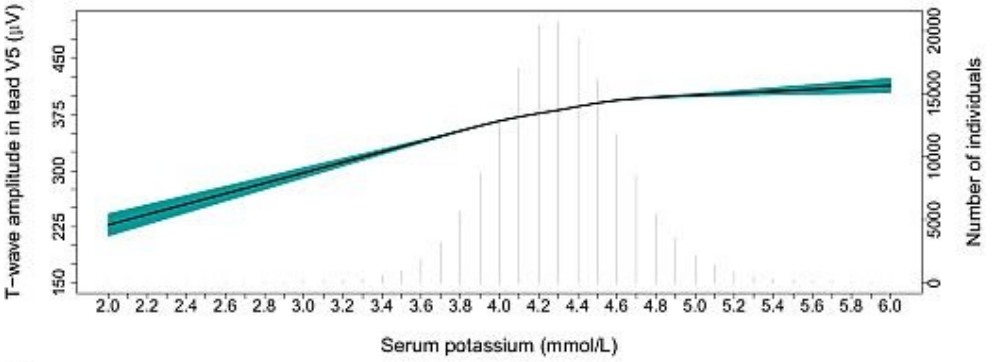
Aims

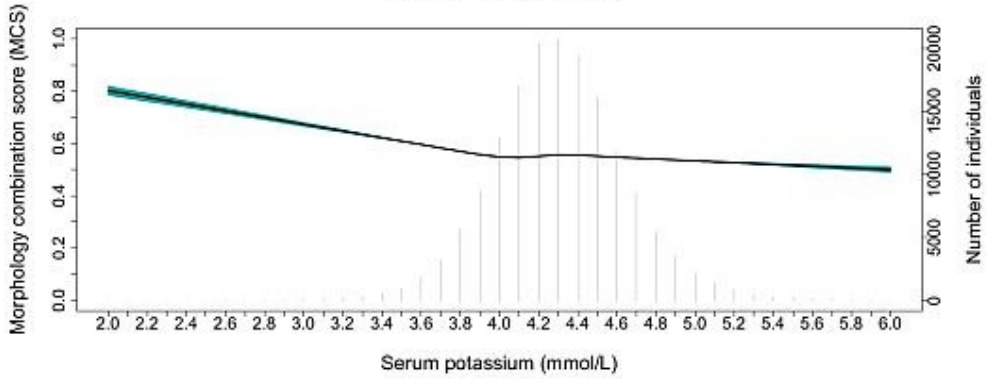
Potassium disturbances are common and associated with increased morbidity and mortality, even in patients without prior cardiovascular disease. We examined six electrocardiographic (ECG) measures and their association to serum potassium levels.
Methods and results

From the Copenhagen General Practitioners' Laboratory, we identified 163,547 individuals aged =16 years with a first available ECG and a concomitant serum potassium measurement during 2001-2011. Restricted cubic splines curves showed a non-linear relationship between potassium and the Fridericia corrected QT (QTcF) interval, T-wave amplitude, morphology combination score (MCS), PR interval, P-wave amplitude and duration. Therefore, potassium was stratified in two intervals K: 2.0-4.1 mmol/L and 4.2-6.0 mmol/L for further analyses. Within the low potassium range, we observed: QTcF was 12.5 ms longer for each mmol/L decrease in potassium ($p<0.0001$); T-wave amplitude was 55.1 μV lower for each mmol/L decrease in potassium ($p<0.0001$); and MCS was 0.09 higher per mmol/L decrease in potassium ($p<0.001$). Moreover, P-wave duration and PR interval were prolonged by 3.1 and 3.3 ms for each mmol/L decrease in potassium ($p<0.0001$), respectively. Within the lowest potassium range (2.0-4.1 mmol/L) P-wave amplitude was 10.7 μV higher for each mmol/L decrease in potassium ($p<0.0001$). Within the high potassium range associations with the above-mentioned ECG parameters were much weaker.
Conclusion

The association of potassium with six commonly measured ECG parameters was non-linear. Strong associations between ECG abnormalities and potassium were seen among individuals with lower potassium levels (£4.1 mmol/L).


QTc Fridericia (ms)
400
420
440
460
480
500
Number of individuals
0
5000
10000
15000
20000
2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0 4.2 4.4 4.6 4.8 5.0 5.2 5.4 5.6 5.8 6.0
Serum potassium (mmol/L)


T-wave amplitude in lead V5 (µV)
150
225
300
375
450
Number of individuals
0
5000
10000
15000
20000
2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0 4.2 4.4 4.6 4.8 5.0 5.2 5.4 5.6 5.8 6.0
Serum potassium (mmol/L)


Morphology combination score (MCS)
0.0
0.2
0.4
0.6
0.8
1.0
Number of individuals
0
5000
10000
15000
20000
2.0 2.2 2.4 2.6 2.8 3.0 3.2 3.4 3.6 3.8 4.0 4.2 4.4 4.6 4.8 5.0 5.2 5.4 5.6 5.8 6.0
Serum potassium (mmol/L)