



# CHARACTERIZATION OF BLOOD DONORS WITH HIGH HAEMOGLOBIN CONCENTRATION



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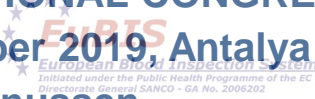


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INTERNATIONAL CONGRESS ON BLOOD SAFETY AND HAEMOVIGILANCE

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International  
Haemovigilance  
Network

# INTRODUCTION

- Donors with abnormally high Hb are rare
- In collaboration with the Copenhagen depts. of clinical haematology, we have looked into the frequency and causes of high Hb in blood donors
- Also, leading up to this study 2 male donors were diagnosed with Polycythaemia Vera
- And in 2015 one male donor

# ERYTHROCYTOSIS

## ○ Primary

- Polycythaemia Vera

## ○ Secondary

- Low oxygen, lung disease, smoking
- Renal artery stenosis
- Increased EPO
- Hypertension
- Diabetes mellitus
- Dehydration related to excessive intake of coffee, tea or alcohol as well as inadequate liquid intake



## METHOD

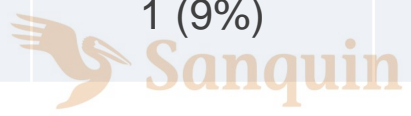
- Donors with Hb above the previous WHO limit for Polycythaemia Vera at 2 donations were included (Current WHO limit is 16 and 16.5)
  - Women with Hb  $\geq$  16.5 g/dl
  - Men with Hb  $\geq$  18.5 g/dl
- They were offered investigations by a specialist in clinical haematology, with JAK2 V617F and JAK2 exon12 tests, and a thorough clinical examination

# INCLUSION

- Over 2 years Nov. 2009 – Nov. 2011
- 224 357 donations (from app. 55 000 donors)
- 48 donors (35 women, 13 men) with 2x High Hb
  - 2 women declined
    - 1 because of current investigations of Diabetes Mellitus Type II
    - 1 because of a self-motivated reduction in smoking and coffee, which reduced her Hb from 16.6 g/dl to 15.3 g/dl at her next donation 6 months later
- 46 donors included (33 women, 13 men)

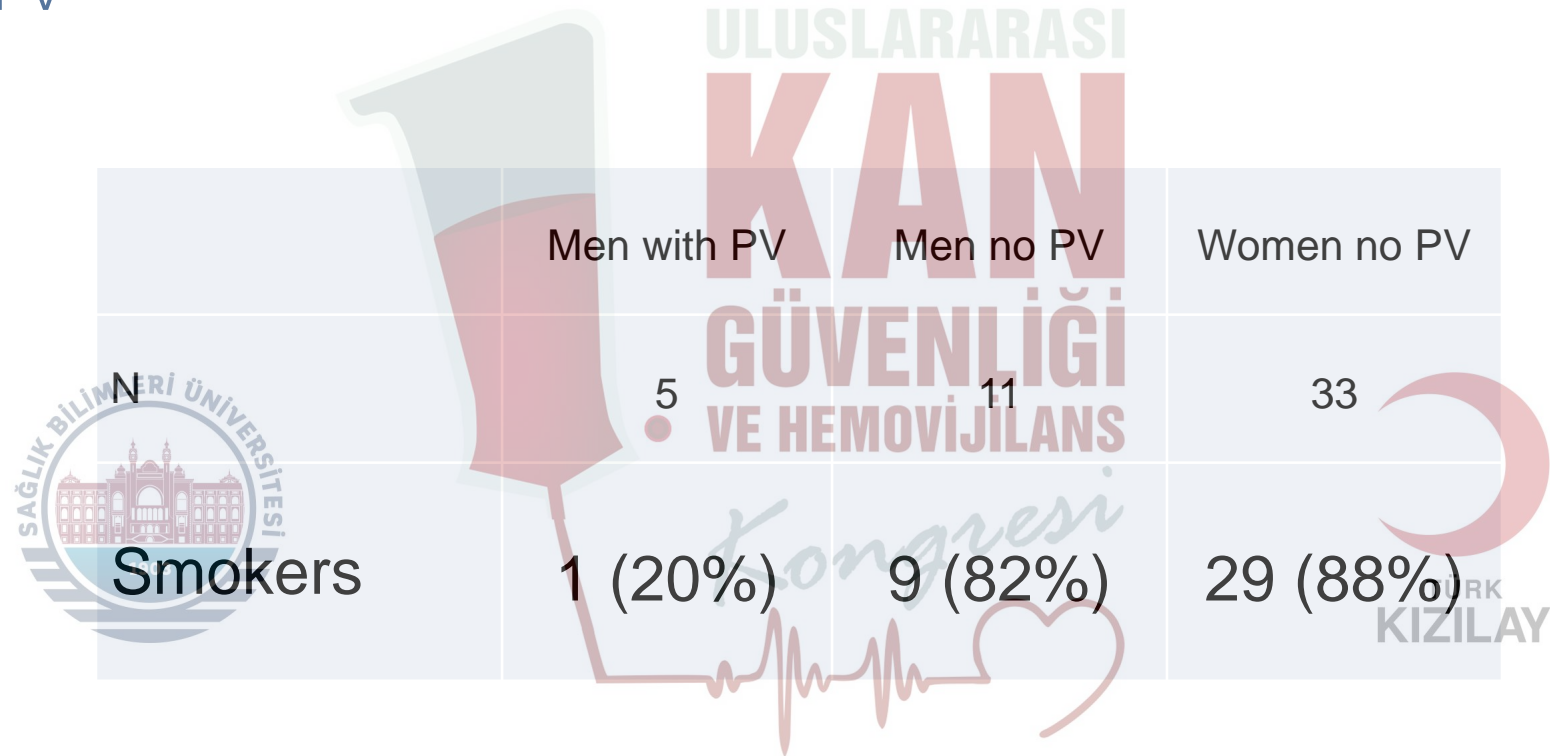
## DATA ON THE INCLUDED NON-PV DONORS COMPARED WITH DATA ON THE 5 DONORS DIAGNOSED WITH PV

	Men with PV	Men no PV	Women no PV
N	5	11	33
Age	55	51	52
Mean (range)	(30-66)	(29-66)	(27-64)
Number donations	92	69	42
Mean (range)	(4-176)	(7-134)	(2-100)
Plethoric	4 (80%)	6 (55%)	5 (15%)
Hyper metabolic symptoms	2 (40%)	1 (9%)	0



High Hb, K Magnussen

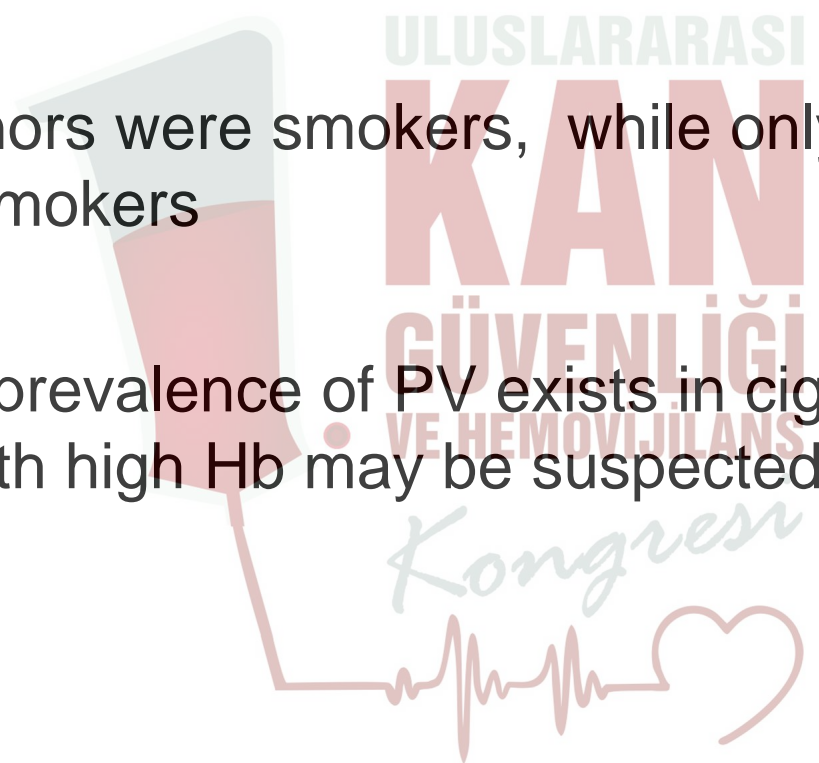
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High Hb, K Magnussen

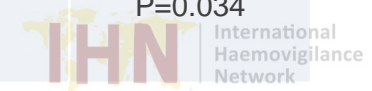
# SMOKERS

- 85% of the high-Hb donors were smokers, while only 18% of our donors in general are smokers
- Although an increased prevalence of PV exists in cigarette smokers, non-smoking donors with high Hb may be suspected of having PV





	Men with PV	Men no PV	Women no PV	Significance
<b>Hb g/dl</b>	<b>19.3</b>	<b>19.2</b>	<b>17.2</b>	<b>n.s.</b>
<b>Mean (range)</b>	<b>(18.7-20.3)</b>	<b>(18.7-20.0)</b>	<b>(16.6-18.5)</b>	
Hct % Mean (range)	55 (51-58)	51 (47-53)	46 (42-52)	p=0.010
EPO IU Mean (range)	2.8 (<1-5.8)	8.8 (5.7-15.4)	9.4 (2.6-19.4)	p=0.004
MCV fl Mean (range)	83 (74-100)	92 (79-99)	92 (84-99)	p=0.004
Ferritin µg/l Median (range)	18 (9-132)	91 (36-194)	37 (15-493)	p=0.07
Leukocyte count 10 <sup>9</sup> /l Mean (range)	10.8 (6.5-21.0)	8.6 (5.2-13.1)	8.8 (4.2-16.3)	n.s.
Platelet count 10 <sup>9</sup> /L Mean (range)	318 (199-471)	22 (147-282)	280 (177-449)	P=0.034



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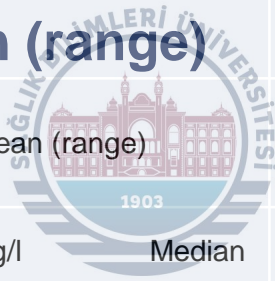


High Hb, K Magnussen

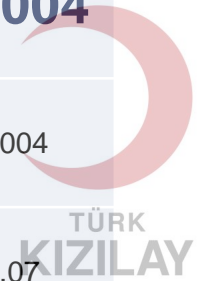
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Hb g/dl Mean (range)	19.3 (18.7-20.3)	19.2 (18.7-20.0)	17.2 (16.6-18.5)	n.s.
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High Hb, K Magnussen

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<b>Platelet count 10<sup>9</sup>/L Mean(range)</b>	<b>318 (199-471)</b>	<b>223 (147-282)</b>	<b>280 (177-449)</b>	<b>p=0.03</b>

# POLYCYTHAEMIA VERA

- Of the 46 high-Hb donors 2 (4%) had PV
  - One JAK2 V617F pos. 59 years old and 99 donations
    - Hb was 18.7 g/dl and mutation load 37%
  - One negative for JAK2 V617F and exon12, but he had increased red cell mass and was endogenous erythroid colony assay positive; 66 y 103 donations
    - Hb 19.0 g/dl
- The two donors found in the preceding years
  - One JAK2 V617F pos. 55 y 80 donations
    - Hb 20.3 g/dl
  - One JAK2 exon 12 pos. 64y 176 donations
    - Hb 19.3 g/dl
- After the study, in 2015 one male donor was diagnosed
  - 30 years 4 donations JAK2 V617F pos (Hb19.2g/dl)



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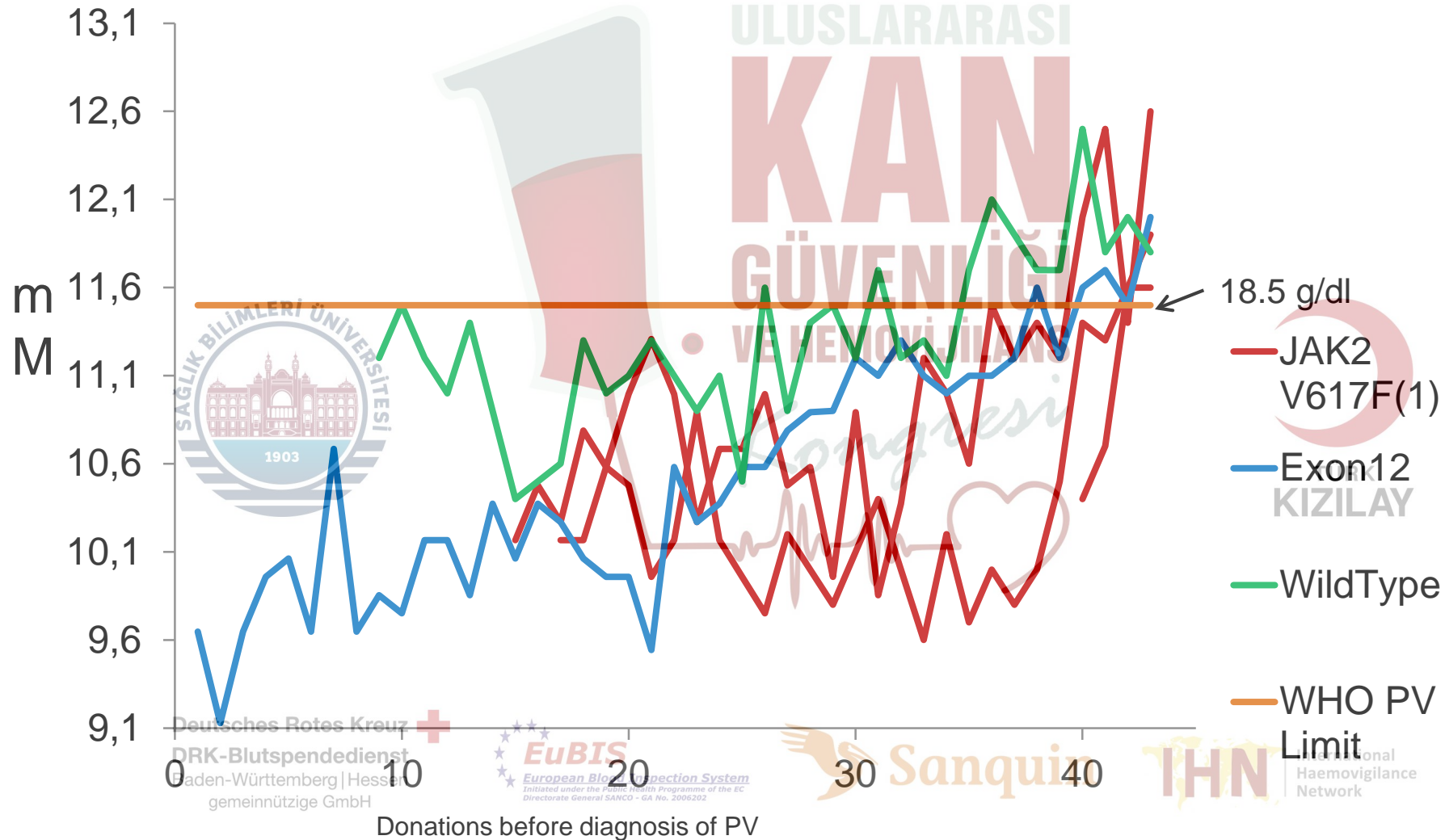
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# HB UP TO DIAGNOSIS OF PV IN 5 BLOOD DONORS



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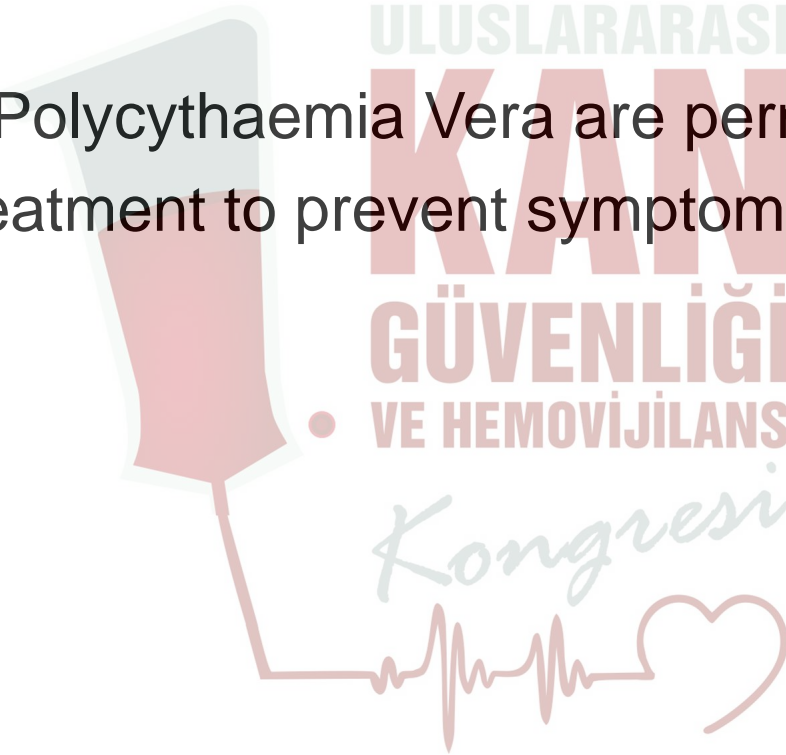
# FREQUENCY OF POLYCYTHAEMIA VERA

- PV is a rare disease, but higher prevalence among blood donors has been suggested
  - prevalence of 0.2% positive for JAK2 V617F in the Cph City Heart Study among 10 507 participants aged 20–95
- In the present study, only 0.02% of donations had Hb above the WHO level for investigating for PV
- In 8 years, we found 5 donors with PV, of whom only three were JAK2 V617F positive
- This does not suggest increased incidence in the donor population



## PV AND DONATION

- Donors diagnosed with Polycythaemia Vera are permanently deferred
- They need to receive treatment to prevent symptoms owing mainly to hyper viscosity



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# HYPERTENSION

- 5 donors (11%) had severe hypertension

	Age	BP mmHg	Hb g/dl	Other diagnosis	Smoker
Woman	48	228/146	18.0	Kidney artery ste.	Yes
Woman	59	192/107	17.6	High cholesterol	Yes
Woman	55	180/100	16.9		Yes
Woman	47	230/114	16.9	DM II	Yes
Man	65	211/112	19.8		No

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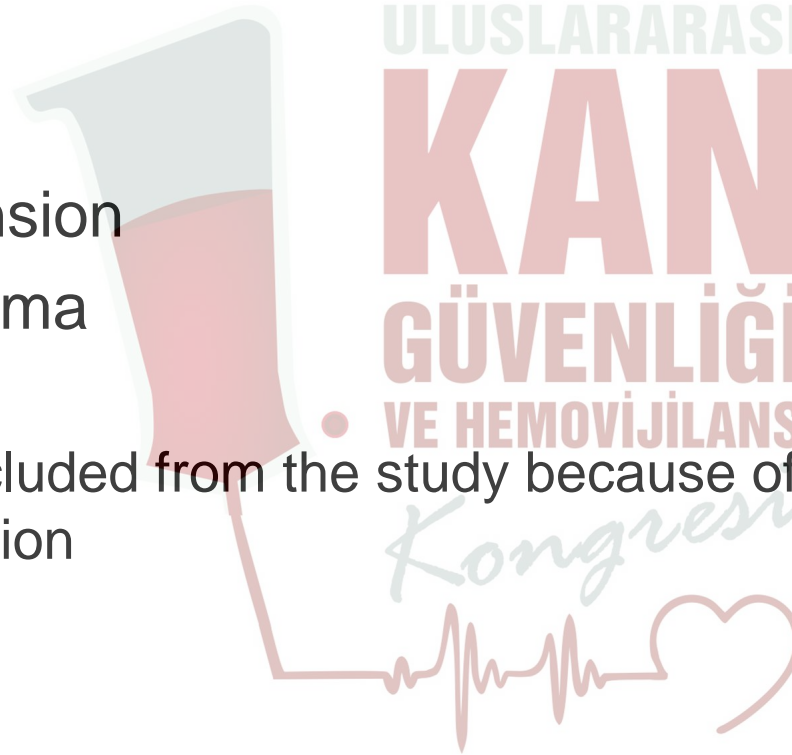
**FuBIS**  
European Blood Inspection  
Institute for the Public Health Program  
Directorate General SANCO - GA No. 2006202

**Sanquin**

**THN**  
International Haemovigilance Network

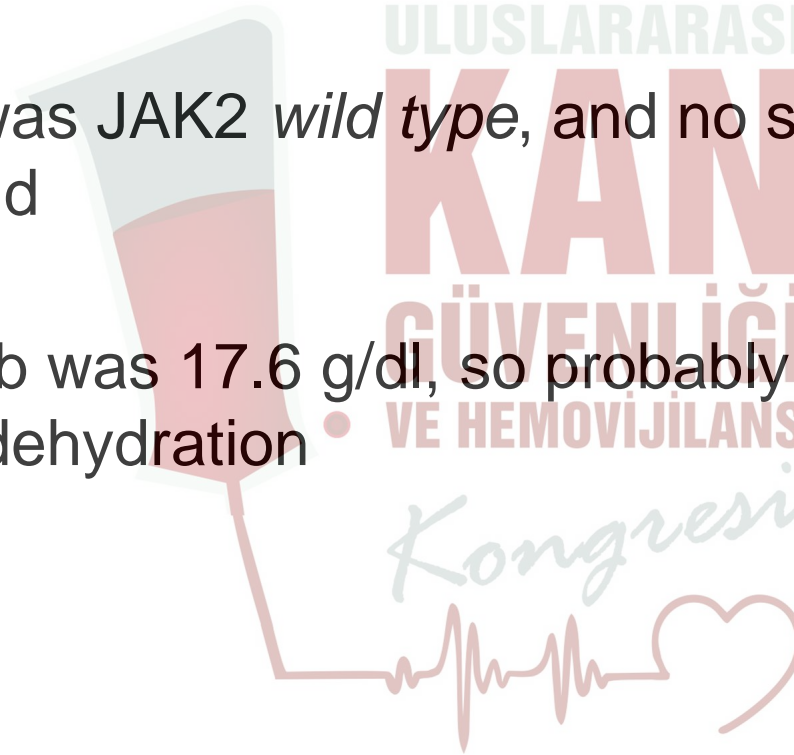
# DIABETES MELLITUS

- Two women, 4%
  - 1 DM II and hypertension
  - 1DM II and myxoedema
- Also one donor was excluded from the study because of DM II diagnosed right after her last donation



## NORMAL VARIATION?

- One male donor (2%) was JAK2 *wild type*, and no secondary cause of erythrocytosis was found
  - Hb 19.3 g/dl
- At his latest donation Hb was 17.6 g/dl, so probably there previously was some unadmitted dehydration



# OTHER

- Two (1 man and 1 woman) was excluded before the next donation because of unspecified medical reasons
- One male donor was tested with haemoglobin electrophoresis, which was normal
  - He was 36 y, from Pakistan with Hb 18.5 g/dl and noniron-deficient microcythaemia (MCV 79fl)
  - Smoking probably caused his high Hb, but we found no explanation for his mild microcythaemia

## IN ALL

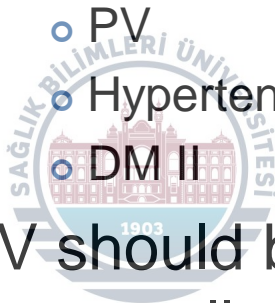
- The clinical investigations identified
  - 10 donors (22%) were permanently deferred from blood donation
  - 34 (74%) continued as blood donors
  - 2 (4%) chose not to donate again
- In the group of high Hb donors, we found a high prevalence of morbidities (22%)
- And bare in mind that the risk of thromboembolic disease increases with increased Hct

# HB ON THE 33 DONORS WHO HAVE DONATED AGAIN (AT THE COPENHAGEN BLOOD CENTRE)

	Donors donating again	Hb when included mean (range)	Hb at donation before Sep 13 mean (range)	Significance
Male donors	8	19.3 g/dl (18.7-20.0)	18.0 g/dl (16.9-19.0)	p= 0.015
Female donors	25	17.1g/dl (16.5-18.5)	16.4g/dl (15.3-18.9)	p<0.000

# CONCLUSION

- Among donors with high Hb
  - High prevalence of smokers (85%)
  - High prevalence of disease (22%)
    - PV
    - Hypertension
    - DM II
- PV should be suspected when donors with abnormally high Hb have iron-deficiency
- With the new lower WHO limit for PV, PV may be found sooner – but MANY will have secondary erythrocytosis
- We did not find an increased prevalence of PV



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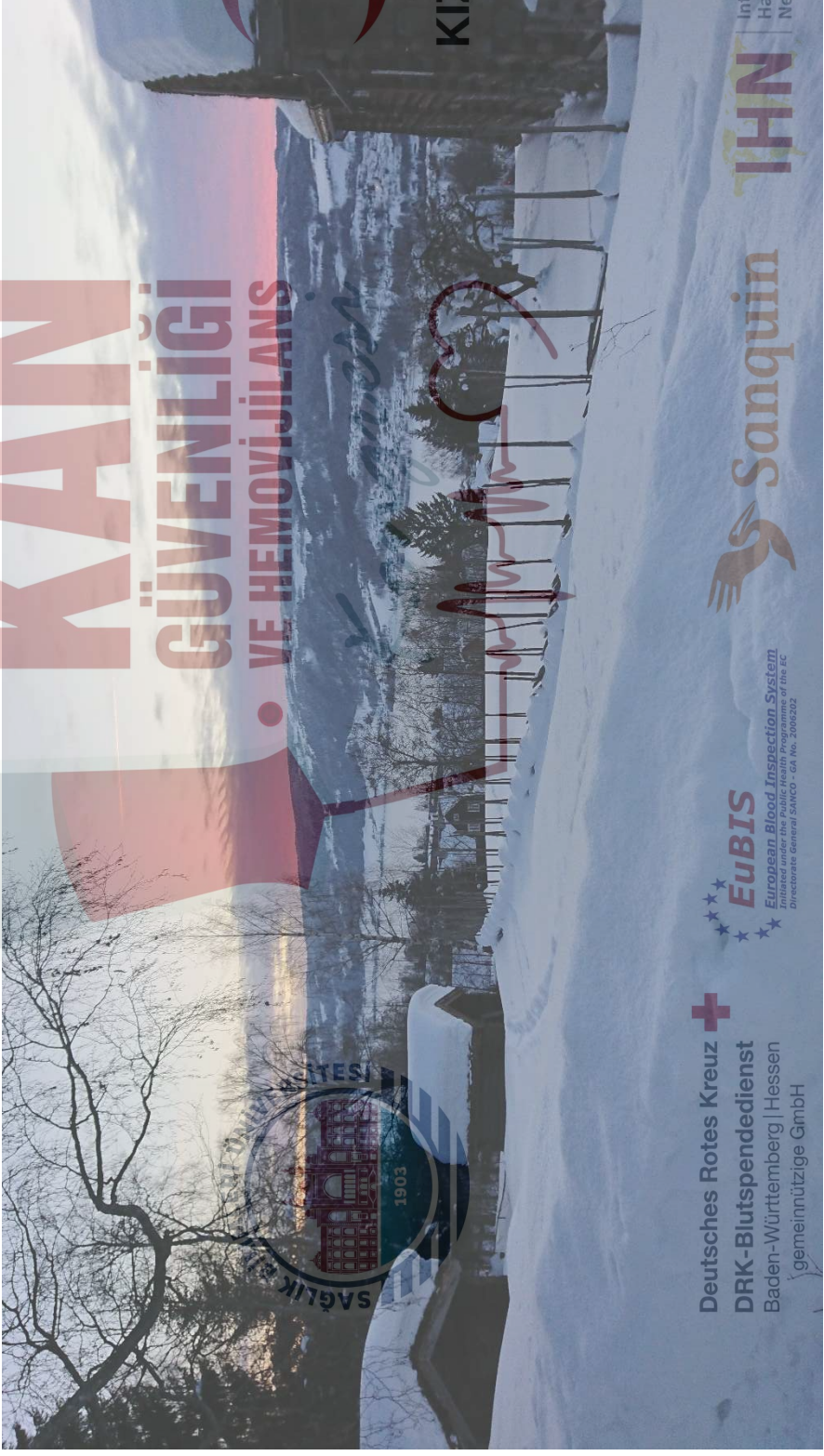
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# TEŞEKKÜR EDERİM

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