

# Association of FGF-23, klotho, and serum 25-OH Vitamin D with shift work in Korean firefighters: a cross-sectional study.

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## BACKGROUND

- ❖ Shift work is known to disrupt the human circadian rhythm and risk factor for sleep disorder, metabolic syndrome and cancer.
- ❖ International Agency for Research on Cancer (IARC) classified shift work as a group 2A carcinogen in 2007.
- ❖ Fibroblast growth factor-23 (FGF-23) regulating phosphate homeostasis is cancer related gene, which mutation may promote cancer progression.
- ❖ Klotho that making complex with FGF-23 is known as tumor suppressor gene.
- ❖ Homeostasis of phosphate concentrations was regulated by FGF-23, klotho and Vitamin D feedback loop.
- ❖ Previous studies consistently reported that elevated FGF-23 and decreased Vitamin D were related to cancers.

## STUDY OBJECTIVES

- ❖ To evaluate the association of FGF-23, Klotho, and Vitamin D with shift work in Korean firefighters.

## METHODS

### Study Population

- ❖ 483 firefighters in six fire stations in Korea where we randomly select firefighters, considering gender, age, job tasks (administration, first aid, fire suppression, fire investigation rescue) and shiftwork schedule(day work, 3 cycle, 6 cycle, 9 cycle).

### Measurement

- ❖ Sociodemographic characteristics by questionnaire
- ❖ Job characteristics
- ❖ individual medical history (hypertension, diabetes, sleep disorders, cancers)
- ❖ health habits(smoking, drinking alcohol, exercise)
- ❖ Vitamin D, FGF-23, and Klotho in blood

### Statistical Analysis

- ❖ The difference of study population was performed by Chi-square test and ANOVA.
- ❖ For comparison of klotho according to work schedule and work type was used by ANCOVA.
- ❖ Statotocal analysis was performed using R 3.60 ver.

## RESULTS

Figure 1. Work Schedule & Work Type

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3 Cycle	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow
6 Cycle	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow
9 Cycle	Blue	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue
21 Cycle	Blue	Blue	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue	Blue	Yellow	Blue
24h work	Group1											Fire suppression, First aid									
Day work : 09 AM ~ 18 PM	Group2											Rescue									
Night work : 18 PM ~ 09AM	Group3											Fire investigation, Administration									
Off-day																					

Figure 2. General characteristics of study population

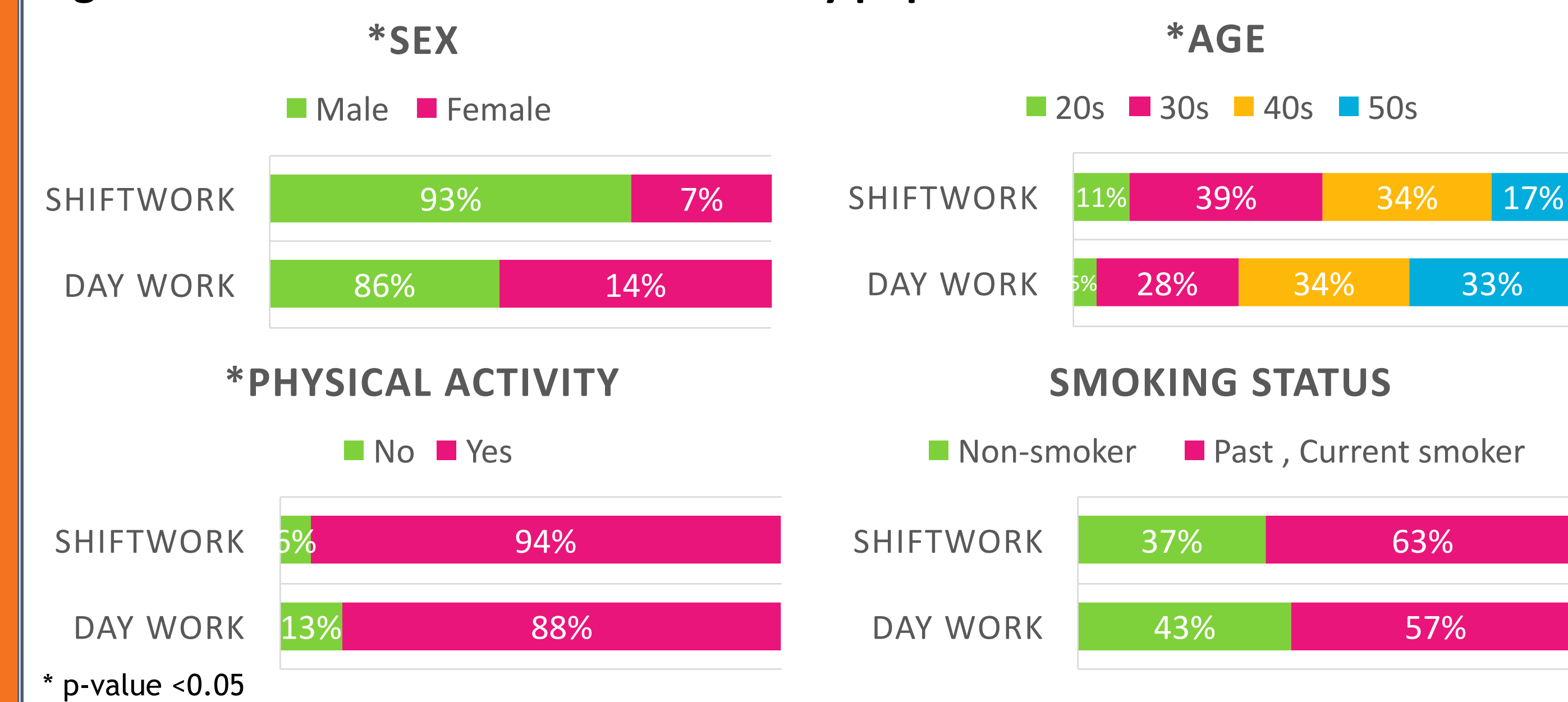


Figure 3. FGF-23, Klotho concentration by general characteristics

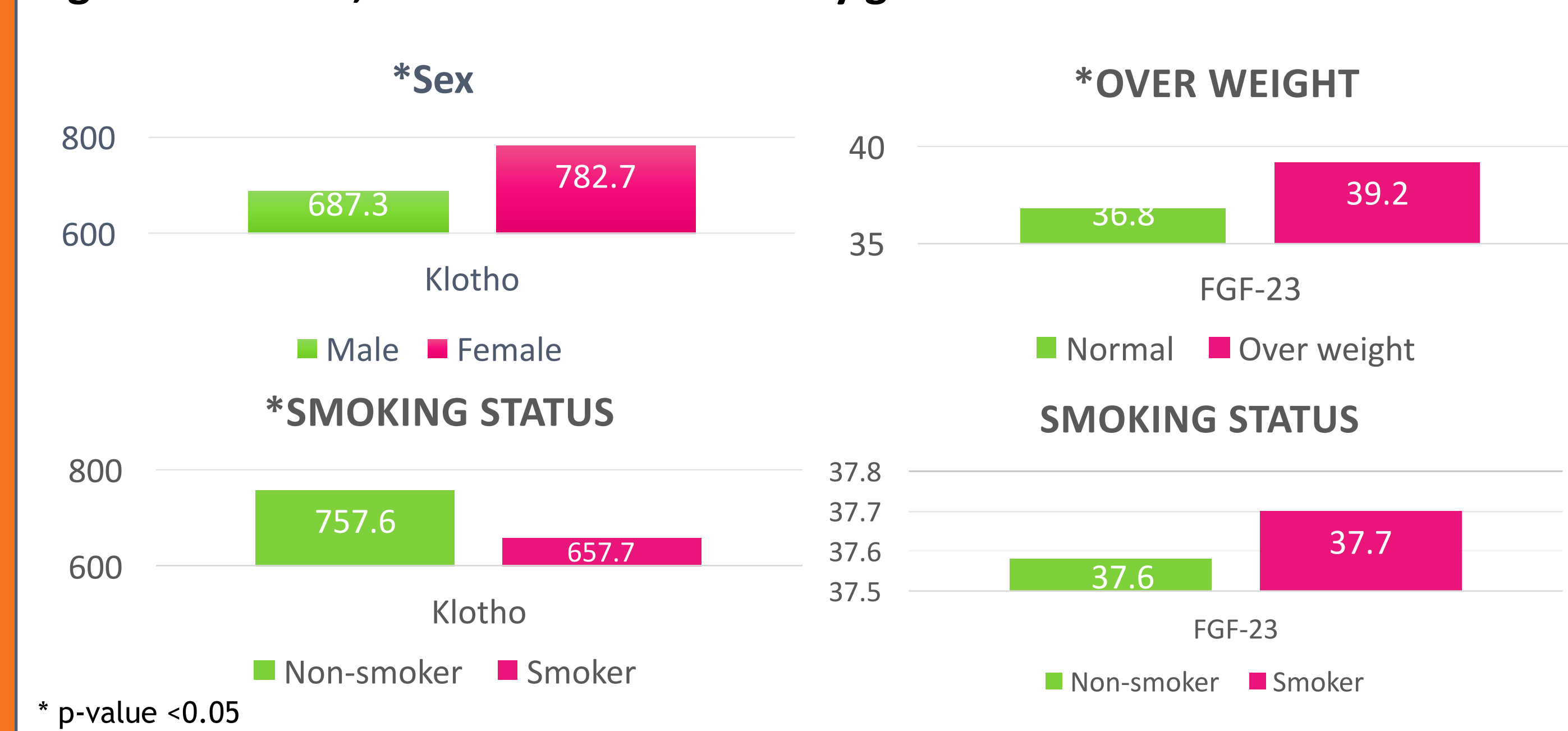


Figure 5. Comparison of FGF-23 according to work schedule and type

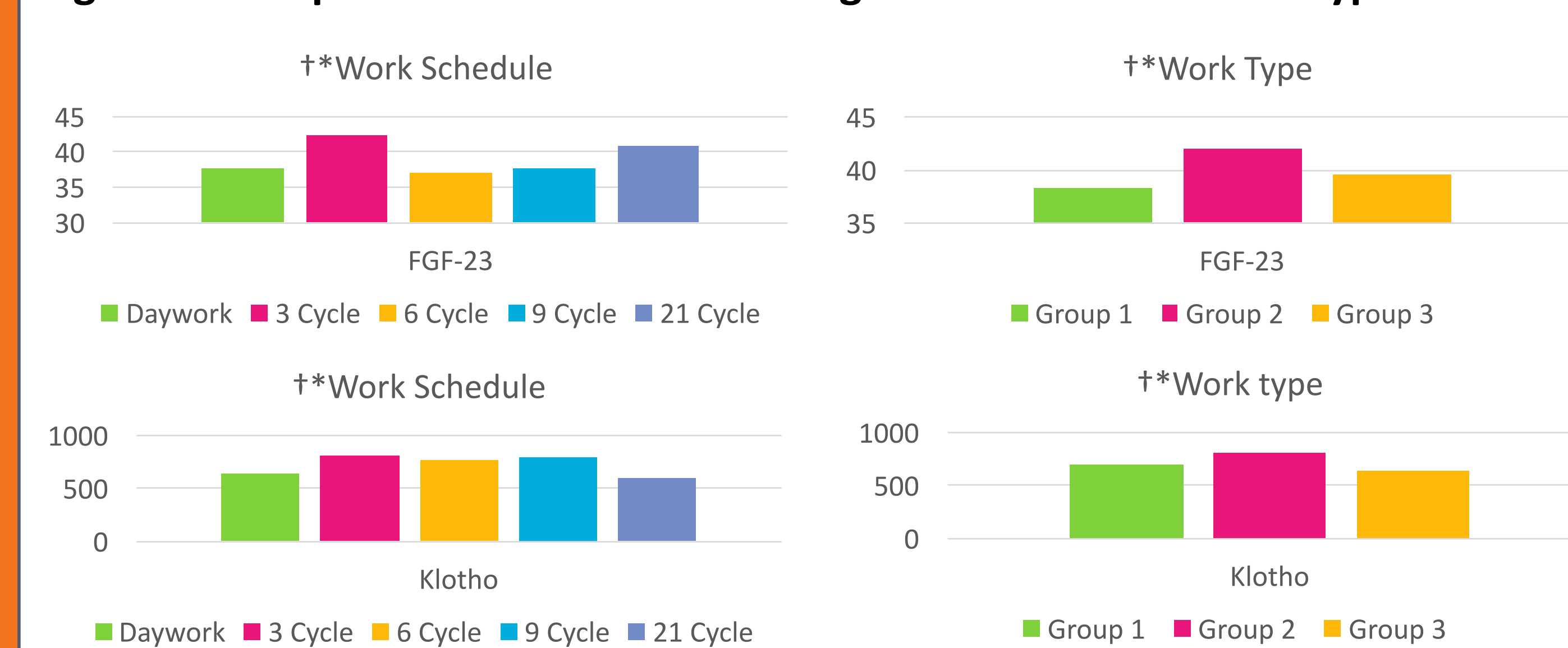


Figure 5. Comparison of FGF-23 according to work schedule and type

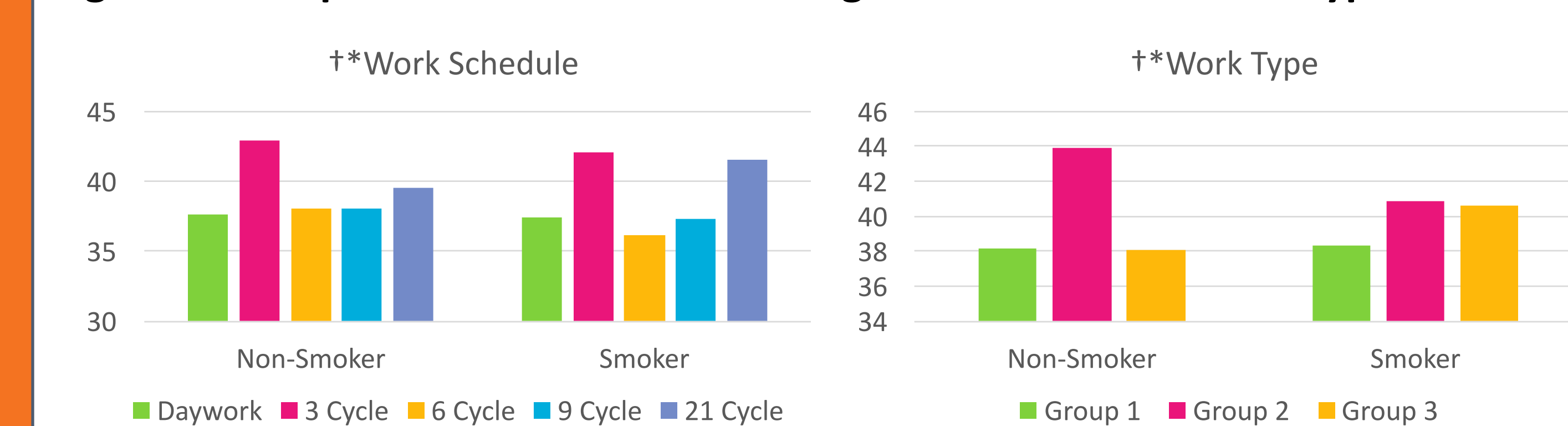
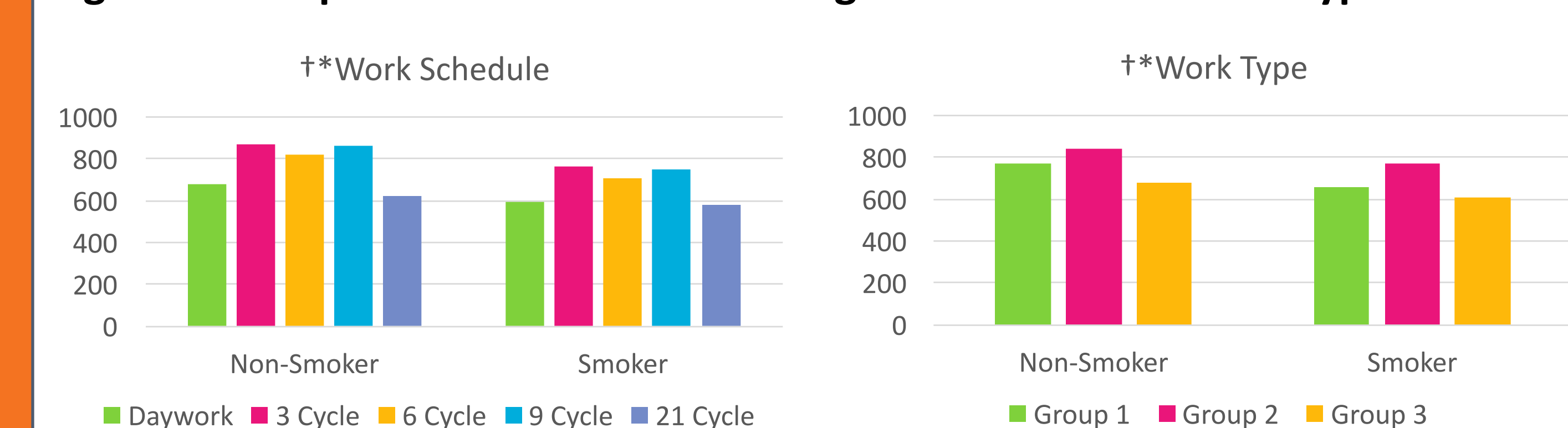


Figure 6. Comparison of Klotho according to work schedule and type



- 3 Cycle ranked highest klotho and FGF-23 concentrations.
- Group 2, rescue team, had highest klotho and FGF-23 concentration

## CONCLUSIONS

- We found that FGF-23, Klotho have a significantly positive relationship with shift work.
- VitD3 didn't show significant association with shiftwork.
- In subgroup analysis, 3 cycle in work schedule, and rescue team ranked highest klotho and FGF-23 concentration.
- For monitoring impact of shift work, alpha-klotho and FGF-23 might be used as pre-clinical biomarker for predicting cancer.

## REFERENCES

1. Dalton GD, Xie J, An SW, Huang CL. New insights into the mechanism of action of soluble klotho. *Front Endocrinol (Lausanne)*. 2017;8(NOV):1-10.
2. Pedersen L, Pedersen SM, Brasen CL, Rasmussen LM. Soluble serum Klotho levels in healthy subjects. Comparison of two different immunoassays. *Clin Biochem [Internet]*. 2013;46(12):1079-83. Available from: <http://dx.doi.org/10.1016/j.clinbiochem.2013.05.046>
3. Romano A, Vigna L, Belluigi V, Conti DM, Barberi CE, Tomaino L, et al. Shift work and serum 25-OH vitamin D status among factory workers in Northern Italy: Cross-sectional study. *Chronobiol Int*. 2015;32(6):842-7.