

Finding a 'fingerprint' of wholegrain food intake in blood

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Introduction

- History of 1000 family study can be traced back to 1947, when Sir James Spence recruited 1142 babies born in May and June in Newcastle.
- The original objective of the study was to investigate the reasons behind infancy infection.
- As of 2013, heart diseases such as high blood pressure is one of 5 big killers in UK (Roberts,2013).
- Wholegrain intake has become a topic of interest as consumption of wholegrains is suggested to decrease the risk of heart diseases and type 2 diabetes.
- Hence, the focus of 1000 family study has now changed to investigating the effects of wholegrain consumption in lowering risk of hypertension, high blood cholesterol and type 2 diabetes
- Alkylresorcinols (AR) are phenolic lipids found in the bran of wholegrain wheat and rye and is an indicator of wholegrain intake.

Aims

- To determine the wholegrain intake of 118 participants aged 60 years in the 1000 family study using AR as a biomarker.
- To investigate the relationship between wholegrain consumption and blood pressure (BP) levels, fasting blood glucose (BG)I levels as well as cholesterol levels.

Methods



Sample preparation

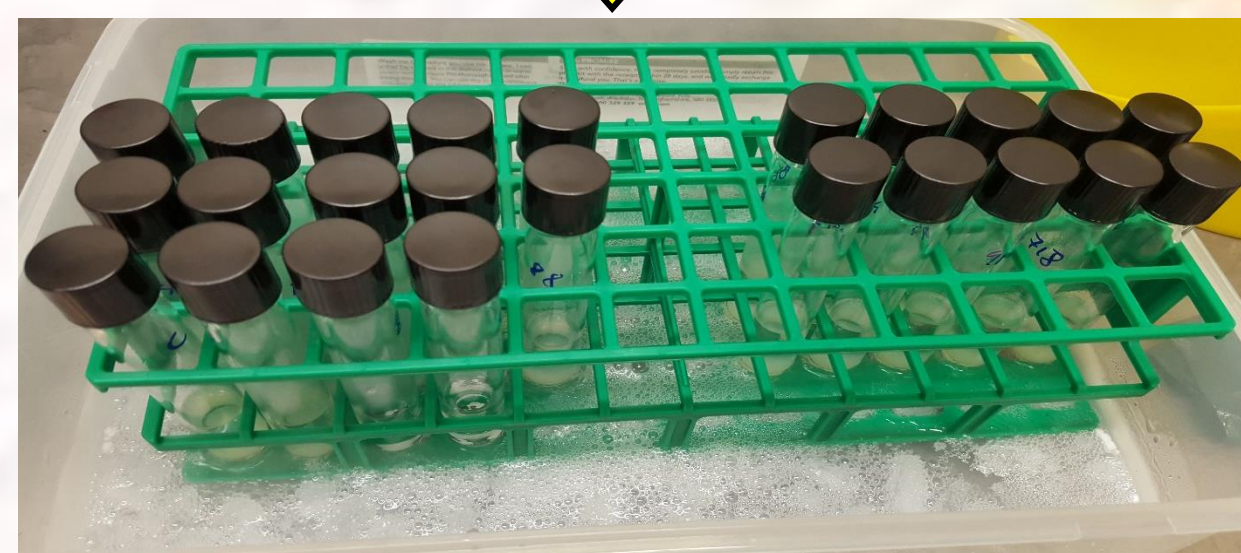
Sample : 10µL Internal Standard (IS) + 200 µL sample + 1mL 50% ethanol
Control : 10µL IS + 200 µL control + 1mL 50% ethanol
Blank+IS : 10µL IS + 200 µL distilled water + 1mL 50% ethanol
Blank : 200 µL distilled water + 1mL 50% ethanol



Analyse and compare with participants' existing data



Sample clean up to remove interferences and further drying



Sample extraction with 9mL diethyl ether in ethanol/dry ice



Dry under nitrogen (50°C)

Results and Discussion

- Figure 1 showed a positive relationship between AR and systolic BP, hence, AR concentration is directly proportional to systolic BP of participants
- Figure 2 showed a negative relationship between AR and diastolic BP, hence, AR concentration is inversely proportional to BG levels of participants
- Figure 3 showed a negative relationship between AR and diastolic BP, hence, AR concentration is inversely proportional to diastolic
- Figure 4 showed a negative relationship between AR and cholesterol, hence, AR concentration is inversely proportional to cholesterol levels

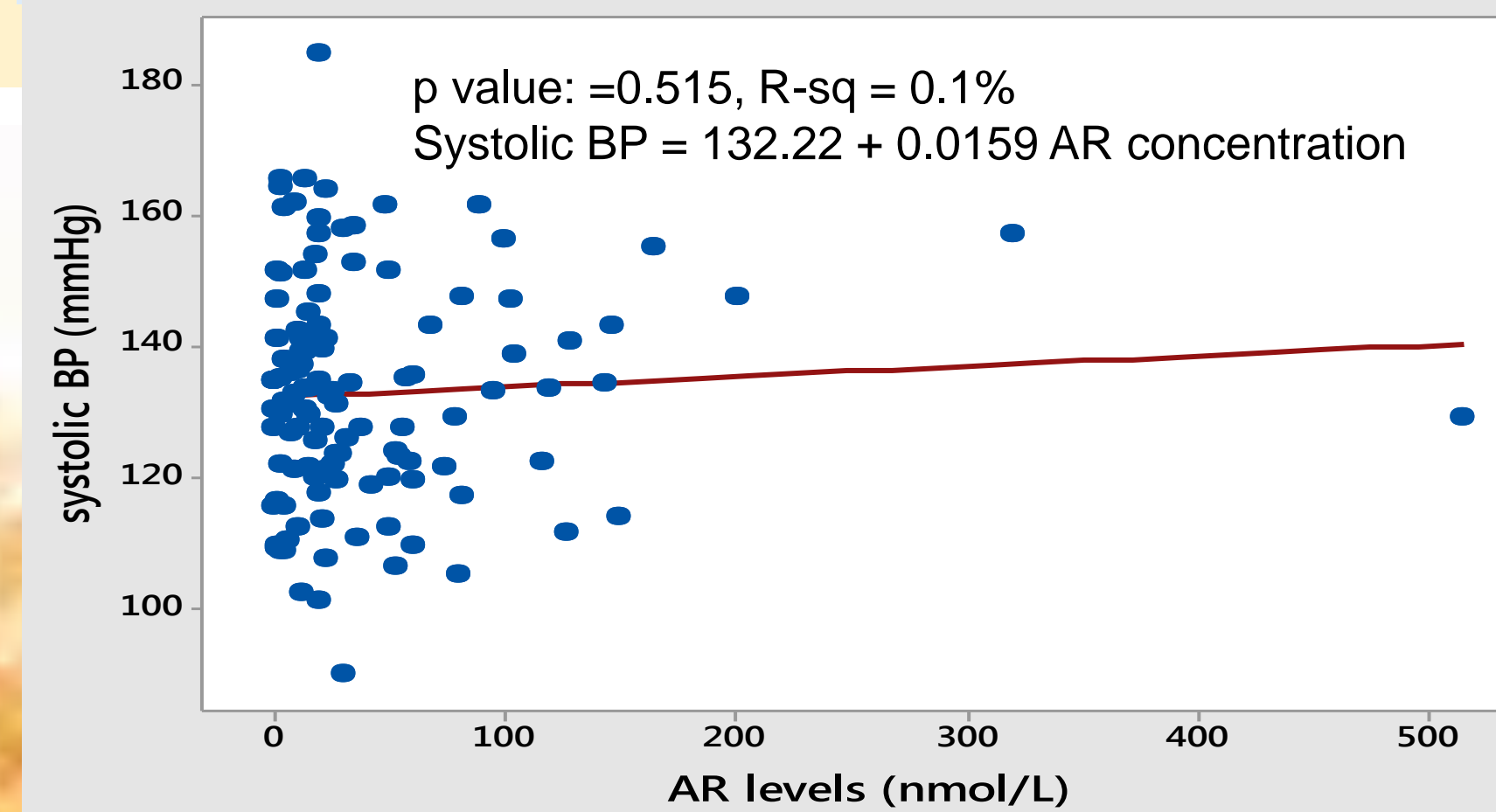


Figure 1. Relationship between Systolic BP(mmHg) and AR (nmol/L)

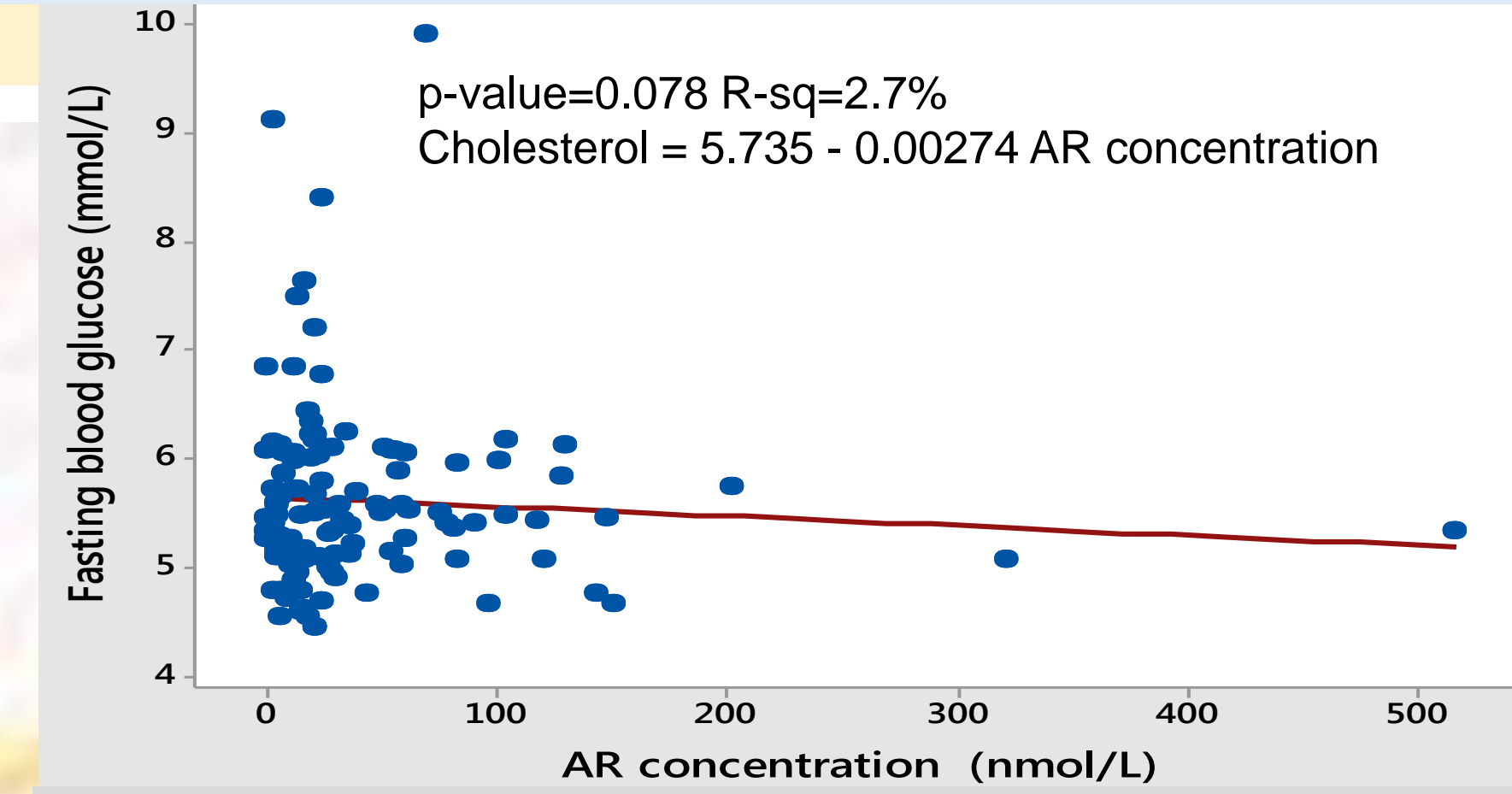


Figure 2. Relationship between Fasting BG(nmol/L) and AR (nmol/L)

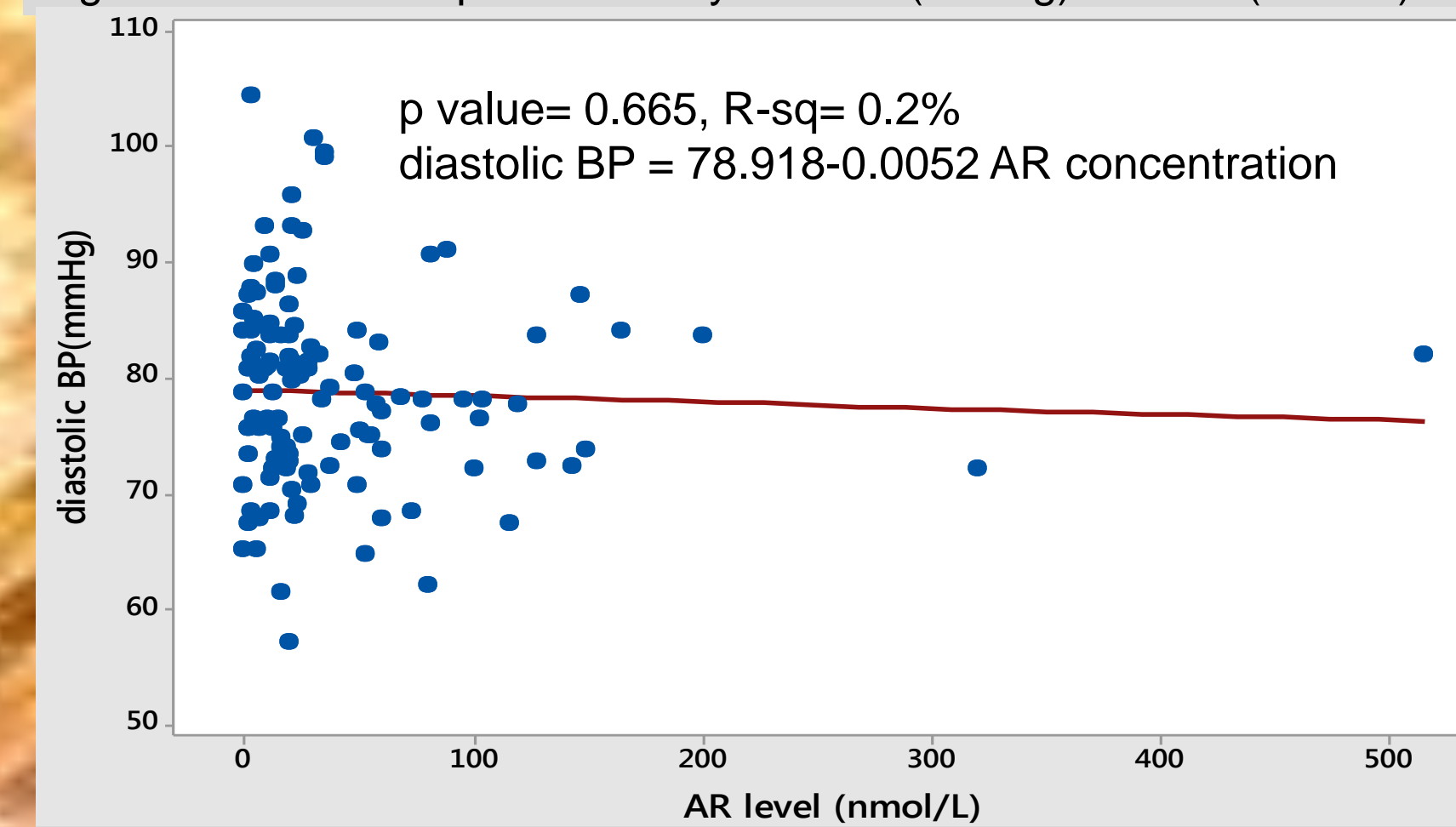


Figure 3. Relationship between diastolic BP(mmHg) and AR (nmol/L)

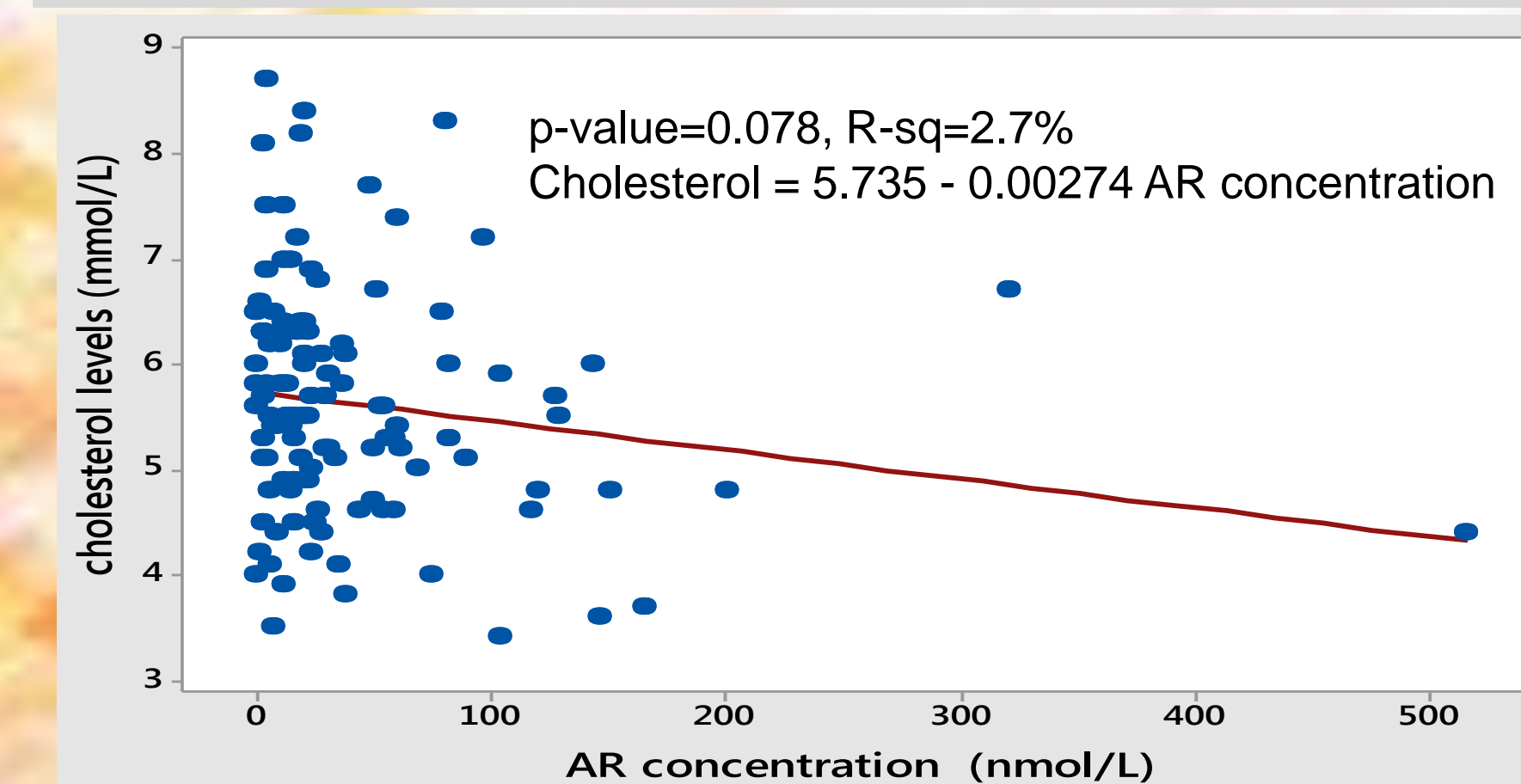


Figure 4.. Relationship between cholesterol(nmol/L) and AR (nmol/L)

- Low R-sq for all variables indicates poor linearity between AR concentration and systolic BP, showing little correlation between AR levels and the variables (BP, cholesterol and BG)
- At $\alpha=0.05$, p-value >0.05 for all variables, indicating that AR levels is not significantly related to the variables
- Results indicates that : wholegrain consumption is not significantly related to risk of high blood pressure, diabetes and high cholesterol
- Results suggests that: wholegrain consumption increases systolic BP while decreasing diastolic BP, fasting BG as well as cholesterol levels which can be due to cholesterol-lowering effect of soluble fibre and short chain fatty acids in wholegrains.
- Antioxidants and phytonutrients present in wholegrains are also suggested to increase insulin sensitivity and lower BP levels.
- Results for systolic BP disagrees with various studies (Lanberg et al.,2013;Tighe et al., 2010). Hence, further investigation on effects of wholegrain intake on systolic BP can be done
- Confounding factors like consumption of other foods that may affect BG, BP and cholesterol measurements may have affected results.
- Carryover effect from previous sample may have caused residue from previous sample to be transferred and analysed with next sample, thus, overestimating AR levels. Hence for future studies, samples should be washed even more frequently with methanol to prevent carryover

References

Jonnalagadda, S. S., Harnack, L., Liu, R. H., McKeown, N., Seal, C., Liu, S. M. and Fahey, G. (2011) 'Putting the Whole Grain Puzzle Together: Health Benefits Associated with Whole Grains Summary of American Society for Nutrition 2010 Satellite Symposium', *Journal Of Nutrition*, 141(5), pp. 1011S-1022S.
Lanberg, R., Aman, P., Hallmans, G. and Johansson, I. (2013) 'Long-term reproducibility of plasma alkylresorcinols as biomarkers of whole-grain wheat and rye intake within Northern Sweden Health and Disease Study Cohort', *European Journal of Clinical Nutrition*, 67(3), pp. 259-63.
Roberts, M. (2013) *Unhealthy Britain: nation's five big killers*. Available at: <http://www.bbc.co.uk/news/health-21667065>.