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Chronic Disease and Health Risk Behaviors Among Rural Agricultural Workforce in Queensland

Janani Pinidiyapathirage[a], Megan O'Shannessy[b], Jane Harte[a,b], Susan Brumby[c,d], and Scott Kitchener[a,b]

[a]Agricultural Health and Medicine Research Group, University of Southern Queensland, Toowoomba, Australia; [b]Rural Health Stream, Griffith University, Toowoomba, Australia; [c]School of Medicine, Deakin University, Waurn Ponds, Australia; [d]National Centre for Farmer Health, Western District Health Service, Hamilton, Australia

ABSTRACT

Introduction: Little is known of the lifestyle behaviors and prevalence of chronic disease in the Australian agricultural workforce. This study aimed to assess behavioral risk factors and the prevalence of chronic disease among attendees of agricultural events in rural Queensland. Methods: Data on lifestyle risk factors and prevalence of diabetes and cardiovascular diseases were collected from participants in four separate cross-sectional studies in rural southern Queensland. Anthropometric measures, blood pressure, serum cholesterol, and glucose levels of consenting participants were assessed by trained medical students under the supervision of rural clinicians. Data were analyzed using SPSS 22 statistical software package and *t*-tests and chi-square tests were used to compare differences between groups. Results: A total of 702 attendees participated; the majority were agricultural workers (n = 393). Greater psychological distress was reported among participants from these rural communities (42%) than in the Australian population (31%); however, levels of psychological distress was similar between agricultural workers and others in the sample. Fewer people in these agricultural communities reported smoking (10%), and they reported being more active (86%) than the average Australian, but a greater proportion reported high-risk alcohol consumption (53%) and were found to be hypertensive (31%). These findings were accentuated among agricultural workers. Conclusion: This method of investigation both raises awareness in the community and identifies health risks for further management in a group that has otherwise been poorly defined. Resident agricultural workers have different health risks and behaviors, though psychological distress appears to be borne across these communities.

KEYWORDS

Agricultural workers; behavioral risk factors; chronic disease; rural Queensland

Introduction

Rural Australians do not enjoy the same level of health as metropolitan citizens.[1] Poorer health among rural people arises from socio-economic disadvantage, ethnicity, poorer service availability, higher levels of personal risk and more hazardous environmental, and occupational and transportation conditions.[2] Economic and physical exposure to natural disasters and climate change, decreasing income combined with increasing workload and declining rural infrastructure and social connection all impact upon health and social outcomes of rural people.[3,4] In Australia, poorer access to health care services and more prevalent health risk factors increase with geographic remoteness and contribute to poorer health outcomes in rural areas.[5] Health risk factors considered more common among rural Australians are smoking, alcohol use, obesity, and sedentary behavior.[1] Specific rural populations, for whom there is a high environmental and occupational risk but limited health risk information, are those working in agricultural industries.[6,7] Rural and remote parts of Australia harbor most of the country's agricultural workforce, a considerably older age group in comparison to other workers in the country. With increasing age, prevalence of risk factors and chronic disease are expected to increase making, agricultural workers a high risk population group. In addition to these health risk factors of rural Australians and due to their background of less access to health services, agricultural workers and families are also exposed to increased physical, psychological, occupational, and environmental risks.[4,8–10]

This study sought to describe the health of people in agricultural industries comparing and

CONTACT Scott Kitchener s.kitchener@qrme.org.au; s.kitchener@griffith.edu.au Griffith University, Rural Stream Campus, P.O. Box 2076, Toowoomba, QLD 4350, Australia.

contrasting their metabolic, cardiovascular, and mental health risks with those of others in their rural community and the Australian population.

Methods

Participants were recruited at agricultural events held in Kingaroy (10%), Kingsthorpe (40%), Warwick (27%), and Charleville (23%) in rural southern Queensland in 2013, 2014, and 2015. The annual agricultural events attract a large population that is broader than the catchment areas of these towns. The selected towns are located 225 km, 145 km, 160 km, and 740 km, respectively, from the capital and population centers in the south east of the state. They are typical of many rural communities, which are served by rural generalist hospitals and health services. These have generalist medical practitioners with advanced skills in common specialty areas such as obstetrics, anesthetics, internal medicine, and emergency medicine. There are no local specialist medical practitioners, other than occasional visiting specialists, and limited allied health services. All of these communities depend on local agriculture industry. The Darling Downs and Maranoa regions are major meat and livestock production areas with broad-acre cropping for fodder, food, and fiber being the most prevalent industries. During the study period, these communities moved through extended periods of drought.

There were no financial or physical barriers to undertaking the health assessment for those attending the events. A clearly visible banner was displayed on the marquee inviting attendees to participate in the health risk assessment survey. A medical student or a health professional was always available at the front desk to provide any clarifications for those interested in participating. Periodic announcements were also made with the help of the event public addressing system to make the attendees aware of the opportunity to get a health check. All current and retired farmers and those working outside of the agricultural sector who were willing to participate in the survey were recruited. Ethics approval for the study was obtained from the Deakin University Human Research Ethics Committee. Consenting participants completed a health and lifestyle assessment based on the assessment tool initially developed by the National Centre for Farmer Health (NCFH)[6] and modified to include locally relevant health issues (such as skin cancer) and a training module for delivery by medical students. The assessment process was supervised by rural medical practitioners, nurses, and a psychologist with experience in agricultural health and medicine.

Anthropometric measurements were taken of the participants while they wore light clothing and no shoes. Waist circumference was measured to the nearest 0.5 cm, weight was measured to the nearest 0.1 kg, and height was measured to the nearest 0.5 cm on a portable stadiometer. Body mass index (BMI) was calculated using the formula, BMI = weight (kg)/height $(m)^2$ and the measurements were ranked based on the WHO definition.[11] Men with a waist circumference ≥94 cm and women with a waist circumference of ≥80 cm were categorized as having abdominal obesity. Blood pressure was measured using automatic sphygmomanometers. Two measures were taken for each person while they were seated with adequate rest. Hypertension was defined as the presence of a systolic blood pressure of 140 *mmHg* or greater and a diastolic blood pressure of 90 *mmHg* or above, or the reported use of antihypertensive medication. Participants were categorized as inactive if they did not accumulate at least 150 min of moderate intensity physical activity per week. Men having more than six standard drinks or women having more than four standard drinks on a single occasion of drinking at least once a month were categorized as high-risk alcohol consumers. The NCFH used the 2001 National Health and Medical Research Council's (NHMRC) *Australian Alcohol Guidelines* when developing the survey tool used in this study. It should be noted that the current NHMRC guidelines (2009) have lowered the number of drinks for males to four on a single occasion of drinking to minimize alcohol related health risks.[12] Diabetes risk was assessed using the Australian type 2 diabetes risk assessment tool (AUSDRISK).[13] Mental health screening was undertaken using the validated Kessler Psychological Distress Scale (K10). A score of 10–21 was categorized as low to moderate level of psychological distress, and 22–50 was categorized as high to very high level of distress.[14] Serum cholesterol and glucose levels were assessed using a CardioChek PA analyzer. Cholesterol levels were categorized as high if total cholesterol was ≥5.5 mmol/L or low-density lipoprotein (LDL) was ≥3.5 mmol/L or

high-density lipoprotein (HDL) was <1.0 mmol/L for men and <1.3 mmol/L for women. Any greater than or less than values not within the measuring range of the lipid analyzer were discarded from the dataset. Random blood glucose was categorized as high if the reading was ≥11.1 mmol. Any participants with abnormal clinical or biochemical findings or identified with psychological distress were referred to an on-site medical practitioner or psychologist, respectively, and to their preferred health practitioner.

Data were age standardized using the 2011 Australian census data and then compared with the most recent (2014–15) National Health Survey conducted by the Australian Bureau of Statistics.[15] The national survey collects a range of information on health service utilization, health risk factors, prevalence of chronic disease conditions, and other sociodemographic characteristics from the participants. Differences between ages were evaluated using the independent sample *t*-test. Differences between categorical variables were assessed using the chi-square test (two tailed). Data analyses were performed using SPSS (version 22.0) statistical software (IBM SPSS Statistics for Windows, Armonk, NY).

Results

A total of 702 participants completed the health and lifestyle assessment; 2.3% identified themselves as Aboriginal, Torres Strait Islander, Pacific Islander or Maori descent. The mean age of the participants was 54.2 years (SD 15), and 61% were males. Of the participants, 56% (n = 395) either owned or worked on a farm or were employed in farm support services. Age distribution was similar between those self-identified as agricultural workers and others ($P > .05$).

Overall health and mental health status

Only about 42% of study participants rated their overall health between excellent to very good; the proportion giving a similar rating to overall health was much higher in the national survey (56%, $P < .001$). Approximately 40% of participants reported they had experienced moderate to very severe bodily pain at some time during the 4 weeks prior to the survey. In measuring overall health and bodily pain, same categorical grading scale as used in the National Health Survey was used. Compared to the national survey population, the proportion experiencing bodily pain of moderate severity was much higher among study participants (19% *vs* 33%, $P < .001$). Overall health ratings and reporting of bodily pain were similar between agricultural workers and those identified as not directly engaged in the agricultural workforce.

This sample of rural people was more likely to report moderate to very high psychological distress than the Australian population (42% *vs* 31%, $P < .001$). Notably, when comparing those in the sample who identified as being from agricultural industry to those living in the agricultural communities but not directly engaged in agricultural industry, no difference in measured psychological distress was identified. The sample size may have been too small to identify a small difference between agricultural workers and rural residents not engaged in agricultural industries.

Prevalence of behavioral and clinical risk factors

The prevalence of behavioral and clinical risk factors in the study participants compared to the 2014–15 National Health Survey population[15] are presented in Table 1. Compared with the national survey, prevalence of smoking was less among study participants (10% *vs* 15%, $P < .001$); however, a higher proportion of these rural study participants reported occasions of high-risk alcohol consumption (53% *vs* 26%, $P < .001$). This rural sample was less likely to report a sedentary lifestyle (only 14% reported <150 min of moderate intensity activity per week) than the national survey population (44.5%, $P < .001$). Prevalence of obesity based on BMI (25% *vs* 28%) and waist circumference (61% *vs* 62%) were similar to the national survey population. Over 32% of the sampled population had a high blood pressure reading on the day of measurement, and this proportion is significantly higher ($P < .001$) than the proportion with hypertension in the national survey (23%). Of those with a high blood pressure reading, 23% (n = 68) had high readings despite being on some form of blood pressure medication.

The majority of lipid testing (97%) in the present study was not done in a fasting state; however, nonfasting profiles are considered predictive of cardiovascular risk.[16] Compared with the national survey population, total cholesterol and LDL levels were lower among the study participants.[17] Nonetheless,

Table 1. Prevalence of behavioral and clinical risk factors for cardiovascular disease.

Risk factor	%	
	Study Participants (age adjusted rates)	National Health Survey 2014–15
Current smoking	9.7*	14.5
Alcohol consumption – single occasion high risk at least once a month	53.2†*	26.4††
Insufficient physical activity (<150 minutes of moderate intensity physical activity per week)	14.2*	44.5
High BMI (≥30 kg/m^2)	24.6	27.9
High waist circumference (>94 cm for men, >80 cm for women)	61.3	62.2
High blood pressure reading (Systolic ≥140 mmHg and/or diastolic ≥90 mmHg)	31.9*	23.0
High total cholesterol ¥ (≥5.5 mmol/L)	20.1*	32.8⊠
Low HDL¥ (<1.0 mmol/L for men and <1.3 mmol/L for women)	31.4*	23.1⊠
High LDL¥ (≥3.5 mmol/L)	16.7*	33.2⊠
Random blood glucose value of ≥11.1 mmol or on blood glucose-lowering medication	3.4	Not available

*Denotes statistically significant differences identified using the chi-squared test for proportions.
† Men having more than six standard drinks or women having more than four standard drinks on any single occasion drinking at least once a month.
†† Men or women having four standard drinks on any single occasion drinking at least once a month[12].
¥ Based on data from 531 participants with complete lipid profiles.
⊠ Results based on biomedical component of the 2011–13 Australian Health Survey.

HDL levels were also low among study participants compared to the national survey population (32% *vs* 23%) (Table 1). In the national survey population, 5.1% were detected to have diabetes. Direct comparison of these values with the study population was not possible due to the proportion of non-fasting samples; however, 3.4% of the study participants had a random blood glucose level of ≥11.1 mmol or were on blood glucose-lowering medication at the time of the survey. Twelve of the 16 participants with high random blood glucose values were unaware of the risk of actually having diabetes and were immediately referred to their general practitioner for further investigation.

Agricultural workers within the rural population

We compared the behavioral risk factors between the participants who reported agriculture-related occupations and those who were in other occupations (Table 2). While occupation was not associated with current smoking status, short-term high-risk alcohol consumption was more prevalent among the agricultural workers. The agricultural workers were more physically active and had a lower risk for type 2 diabetes mellitus than rural people of this sample who are not directly related to agricultural industry. The prevalence of other risk factors was similar among those engaged in agricultural and non-agricultural occupations.

Table 2. Association between cardiovascular disease risk factors and occupation.

Risk factor	Occupation		*P* value*
	Agricultural workers† *n* = 395 (%)	Others *n* = 305 (%)	
Age > 45 years	288 (73.0)	238 (78.0)	.120
Current smoking	33 (8.4)	19 (6.2)	.284
Alcohol consumption – single occasion risk at least once a month††	176 (44.6)	112 (36.7)	**.035**
Insufficient physical activity (<150 minutes per week over at least five days)	30 (7.6)	67 (21.9)	**<.001**
High BMI (> 30 kg/m2)	115 (29.1)	98 (32.1)	.390
High waist circumference (>94 cm for men, > 80 cm for women)	286 (72.4)	234 (76.7)	.093
High blood pressure reading (systolic >140 mmHg and/or diastolic ≥ 90 mmHg)	167 (42.3)	122 (40.0)	.554
Dyslipidaemia#	178 (56.7)	134 (61.8)	.244
High AUSDRISK## (score >12)	158 (42.8)	140 (50.9)	**.042**

† Occupation data were not available for two participants.
†† Risk calculated based on 2001 NHMRC guidelines, men having more than six standard drinks or women having more than four standard drinks on any one occasion.
# Based on data from 531 participants with complete lipid profiles not including any individuals for whom hypertriglycereamia was the sole form of dyslipidaemia.
Those currently under treatment for diabetes were excluded.
*Chi-squared test for proportions used
P values emboldened indicate statistical significance.

Associations with psychological distress

Reported variables from all those sampled were stratified by K10 score categorized as low to mild psychological distress and high to very high distress (Table 3). Overall good and excellent health was reported more among those scoring lower on K10. Other associations with higher K10 scores were reporting less than recommended levels of physical activity, high BMI, higher blood glucose levels at some point in time, and less use of seat belts and helmets in vehicles.

Discussion

This study has added to the limited epidemiological picture of the health of agricultural workers and families in rural communities in this region. Several findings in our samples from agricultural communities are not consistent with the current understanding regarding the health of rural Australians. Farmers here have some health issues that are different to other rural people from the same communities, for instance, they were more active but consumed alcohol at more excessively risky levels.

Table 3. Association between K10 scores and selected variables.

	Psychological distress based on K 10 score		
Variable	Low to mild	High to very high	*P* value*
Overall health			**<.001**
Fair to Poor	97 (16.4%)	40 (40%)	
Good to excellent	495 (83.6%)	60 (60%)	
Age (years)			.251
≥60	253 (87.2%)	37 (12.8%)	
<60	339 (84.1%)	64 (15.9%)	
Current smoking			.810
Yes	45 (7.6%)	7 (6.9%)	
No	546 (92.4%)	94 (93.1%)	
At risk consumption of alcohol			.976
Yes	244 (41.4%)	42 (41.6%)	
No	345 (58.6%)	59 (58.4%)	
Less than recommended levels of physical activity			**.013**
Yes	74 (12.5%)	22 (21.8%)	
No	517 (87.5%)	79 (78.2%)	
High body mass index (BMI) (≥30 kg/m^2)			**.045**
Yes	170 (81.3%)	39 (18.7%)	
No	422 (87.2%)	62 (12.8%)	
High waist circumference (>94 cm for men, > 80 cm for women)			.515
Yes	441 (85.0%)	78 (15.0%)	
No	141 (87.0%)	21 (13.0%)	
Reported high blood sugar at some point of time			**.027**
Yes	79 (13.4%)	22 (21.8%)	
No	512 (86.6%)	79 (78.2%)	
Use protective gear when handling chemicals			.788
Yes	231 (68.5%)	34 (66.7%)	
No	106 (31.5%)	17 (33.3%)	
Use protective gear when handling workshop or outdoor equipment			.267
Yes	229 (45.1%)	32 (38.6%)	
No	279 (54.9%)	51 (61.4%)	
Use of sun protection			.503
Yes	322 (55.1%)	51 (51.5%)	
No	262 (44.9%)	48 (48.5%)	
Use seat belt when driving on the road			**.017****
Yes	576 (97.8%)	93 (93.0%)	
No	13 (2.2%)	7 (7.0%)	
Use seat belt when driving on the farm			.228
Yes	96 (19.4%)	12 (14.0%)	
No	398 (80.6%)	74 (86.0%)	
Use a helmet when riding a motorcycle			**.031**
Yes	145 (43.3%)	16 (28.1%)	
No	190 (56.7%)	41 (71.9%)	

*Chi-square test used. **Fisher's exact test used as 1 cell has an expected count less than 5.
P values emboldened indicate statistical significance.

Yet, other health issues are shared across these rural communities, such as psychological stress, which we found to be comparable between farmers and others in the same rural communities and higher than for the Australian population.

Despite many rural people and those involved in the agricultural industry rating their overall health as good, a high proportion reported concerning levels of psychological distress, higher than the general Australian population. Poorer reported overall health was more commonly reported in the presence of psychological distress in these samples. These findings are consistent with the frailty and close economic connectedness of rural communities that are dependent partially or wholly on local agricultural industry.[18] Since agricultural industry is more prevalent in rural areas, this is unlikely to be a similar phenomenon in metropolitan areas with more diverse and substantial economic bases. Not all rural communities are founded on agricultural industry; therefore, this finding cannot be generalized to "rural Australia", but current attention to psychological distress among Australian farmers should be broadened to those in the communities supporting and dependent on agriculture even if not directly involved in farming.

With the exception of smoking, other risk factors already identified as contributing to the poorer health of rural people (alcohol use, obesity, sedentary behavior)[1,19] are supported in our findings. However, smoking was found to be less common among our rural samples than reported in the Australian population. We found no significant difference between the smoking habits of agricultural workers and other local rural people, though the sample size may have missed a small difference in these groups. This may reflect successful local (Queensland) health promotion campaigns and should be considered for future health interventions to rural communities rather than applying a uniform approach to "rural Australia".

Agricultural workers differed from others in their communities in some distinct risk factors. They reported more hazardous use of alcohol, but their AUSDRISK and level of physical activity were reportedly of lesser risk than others in the rural communities. With such a specific finding as the increased hazardous use of alcohol, appropriate health promotion may utilize industry networks for impact and efficiency. The finding also warrants more scrutiny of alcohol use in relation to other known agricultural health risks, such as the higher proportion of vehicle related morbidity and mortality among Australian agricultural workers.[20–22] Psychological distress is also inter-related with other risk factors potentially contributing to adverse health outcomes in the agricultural workplace, especially less reported use of seat belts and helmets in vehicles.

The physicality of agricultural work in these communities is evident in a significantly lower proportion of farmers reporting physical inactivity. This has not translated into reports of more body pain nor into healthier BMI or waist circumferences; however, it may be useful in further interventions addressing the concerning overall level of obesity in sampled communities, particularly on the background prevalence of other cardiovascular risk factors. Lipid studies in these samples suggested people of these rural communities have lesser-associated cardiovascular risks compared to the Australian population and a trend to even lesser risk among agricultural workers. This may be related to a different diet in rural communities, particularly among farmers.

Results of this study should be interpreted in light of certain limitations. Although participants were recruited from a wide geographical area, the sites were limited to one state (Queensland). This limits the generalizability of the findings to the rest of the agricultural workforce in Australia. However, the findings suggest that agricultural communities may have health issues unique to them and, thus, generalizability may not be always warranted when conducting research with specific population groups. Participation in the study was voluntary, convenience sampling was used rather than selecting a random sample, and this can result in section bias. Self-reporting was used when assessing various health risk behaviors, and this can introduce recall bias. Participants self-identified as those involved in the agricultural sector or not, and self-definition could be influenced by social/cultural values and beliefs within the population.

Conclusions

This study has benefited rural communities in highlighting awareness of health risk factors and by directly identifying risks of individuals

particularly for cardiovascular disease. Some successes are evident in management of dyslipidemia and tobacco use; however, there are clear targets for further effort in identification and management of diabetes, hypertension, obesity, and hazardous alcohol use. More work is needed in health promotion, early detection, and risk factor management in agricultural rural communities, but the different preventive health needs of farmers and the concurrent influence of psychological distress in agricultural communities should be considered.

Local epidemiology may be used to direct preventative interventions and determine their effectiveness. It should not be assumed that national rural health findings are indicative of local epidemiology in agricultural communities. Agricultural workers here have been found to have different cardiovascular risk factors, but they share the psychological distress of other rural community dwellers. This information leads to better awareness of the local epidemiology and can direct further investigations and interventions in public health of agricultural communities in this region. Such a model should be considered when there is a question of the generalizability of national conceptions of rural health into a region.

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