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Assessment of Atherogenic Lipid Profile and Pulmonary Functions of Female Cooks in Port Harcourt

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Abstract **Original Research Article**

Cooks are culinary professionals who play a crucial role in the preparation of food in various settings such as restaurants, hotels, catering services, and even private households. Their profession exposes them to regular inhalation of cooking fumes and other potential dangers. This study, thus, assessed the atherogenic lipid profile and pulmonary functions of female Cooks in Port Harcourt metropolis. The study employed a cross-sectional study on 50 cooks (using the Cochran's formula and power analysis calculations with the power at 50%) and 50 of a similar group with the same socio-demographics who are non-cooks served as control subjects for the study. Ethical approval for the study was issued by the Research Ethics Committee of the Faculty of Basic Medical Sciences, Rivers State University and as well as administrative permissions from local municipal authorities and cooking establishment owners in Port Harcourt. Subjects were recruited for the study only after signing a clearly stated consent forms. Biochemical analyses were done on blood sample obtained from the subjects to determine the lipid profile parameter (Total cholesterol, Triglycerides, High-density lipoprotein and low-density lipoprotein). From the lipid profile parameters, the atherogenic indices viz: atherogenic index in plasma (AIP), atherogenic coefficient (AC), and Castelli risk index (CRI) was assessed. An electronic Spirometer was used to assess lung functions: forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1) and FVC/FEV1 ratio. A sphygmomanometer was used to obtain systolic and diastolic blood pressures, and mean arterial pressure was determined. The result indicated a significant difference in the blood pressure of both groups. The lung functions showed remarkably raised levels of Forced vital capacity (FVC), forced expiratory volume in 1 second and (FEV1/FVC ratio. This outcome is suggestive of a possible restrictive lung disorder in the cooks. For the atherogenic indices, a non-significantly raised level of AIP in the Cooks was noted. In conclusion, the findings of the study are suggestive of the risk of cardiovascular and restrictive lung diseases in the Cooks.
Keywords: Cooks, cooking fumes, biomass, lipid profile, pulmonary function, cardiovascular diseases.

1. INTRODUCTION

Evaluations of risks have a direct impact on the occupational safety and health of a work force (Papadopoulos *et al.,* 2010; Oliveira *et al.,* 2018) as it offers a quantitative information on potentially dangerous substances that is particularly useful to employers, employees, researchers, safety and health professionals, and standard- and recommendation-setting organizations (CDC, 2015; Ural & Demirkol, 2008). In addition, setting a special time to periodically check the workplace or working conditions for hazards may assist in identifying potential risks and addressing them before an undesirable incident occurs (Hao & Nie, 2022).

Specifically, it has been noted that, during occupational risks assessments on professional cooks, some important risk factors to be considered include, but not limited to, musculoskeletal disorders, chemical risk, biological risk and exposure or inhalation of cooking fumes (Filippelli *et al.,* 2008). Of course, exposure of Cooks to cooking fumes (CFs) during their work activities constitutes the possibility of health hazards (Wang *et al.,* 2017), including cardiovascular and respiratory diseases (Svedahl, 2018; Chan *et al.,* 2021). Categorically, a study pointed at how cooking fumes could increase the prevalence of respiratory symptoms and cause an acute, reversible reduction in lung functional capacity (Neghab *et al.,* 2017). Cardiovascular diseases (CVDs) are a group of illnesses that mostly affect the heart and blood vessels; they are the major causes of death and disability worldwide, particularly in low- and middle-income nations (WHO, 2009; Olamide *et al.,* 2023). CVDs claimed the lives of an estimated 17.9 million individuals in 2019, accounting for nearly 32% of all worldwide fatalities that year (WHO, 2009).

With preliminary reports on how cooking fumes, with its makeup of a complex mixture of chemicals, could negatively impact on the exposed individuals (Rim, 2023), only scanty research has been done to investigate their specific effects on lipid profile and pulmonary function among cooks (Neghab *et al.* 2017) in Port Harcourt, Nigeria. A reliable assessment of the possible effects of CF exposure on the body especially lipid profiles, atherogenic indices, and pulmonary function (Chan *et al.,* 2021) amongst Cooks is critical in precisely identifying occupational health risks and developing effective prevention strategies. Thus, this study focused on filling this gap.

2. MATERIALS AND METHODS

Study Design

This cross-sectional study recruited Cooks working in selected local cooking establishments in Port Harcourt, Rivers State, Nigeria in order to assess the effects of cooking fumes on atherogenic lipid profile, and pulmonary function among cooks from Port Harcourt, Nigeria.

Study Area

Port Harcourt is the capital city of Rivers State, located in the Niger Delta region of southern Nigeria. With more than three (3) million inhabitants, the city is Nigeria's 5th biggest city and a major industrial hub, particularly for the oil/gas sector, which contributes to over 40% of the country's production. The city's inland areas comprise tropical rainforests, while the coastal regions feature river delta mangrove swamps. Port Harcourt has a humid tropical climate with lengthy and heavy rainy seasons from April to October.

The specific cooking establishments included in this study were privately owned restaurants, cafeterias, roadside food joints (bukas), and street food vendors across the Port Harcourt metropolis. These facilities rely primarily on biomass fuels like firewood, charcoal and kerosene for everyday cooking. The consistent exposure of cooks to burning biomass cooking fuels and their byproducts (smoke, soot, and gases) served as the basis for investigating effects on cardiovascular and pulmonary health parameters.

Study Population

The target population for this research comprised male and female cooks aged 18 to 50 years who were at the time employed/engaged at local cooking facilities in the Port Harcourt Metropolis in Rivers State of Nigeria.

Sample Size Determination

The sample size for this cross-sectional survey was determined using the Cochran's formula with the following assumptions: 95% confidence interval.

Applying the relevant values:

z = 1.96 (standard normal deviate for 95% CI)
p = 0.5
q = 1-p = 0.5
e = 0.05

The Cochran sample size formula:

$$n = \frac{Z^2 p(1-p)}{e^2}$$

Thus, the minimum representative sample was:

n = (1.96)2 x (0.5)(0.5) / (0.05)2
n = 384

However, adjusting for a non-response rate of 15% based on similar surveys, the final minimum sample size was determined to be 50 participants; as 50% estimated proportion of cooks were presumed to have cardiovascular/pulmonary abnormalities based on previous occupational health studies among biomass fuel users (Juntarawijit & Juntarawijit, 2019; Noosorn & Manoton, 2021)., and a 5% margin of error. Based on power analysis calculations with the power at 50% [1 - Power = P(Type II Error)], the optimal representative sample size was determined to be 50 cooks. This was deemed adequate to detect meaningful differences across the exposure levels and outcome parameters. Another 50 subjects with the same socio-demographics who are non-cooks served as control subjects for the study.

Eligibility Criteria

To be eligible, consenting female participants within age 18 and 50 years must have a minimum occupational cooking experience of 6 months involving regular, full-time exposure to cooking fumes and smoke from biomass fuels. The sample size was determined to be 50 cooks working across roadside food vendors, small/medium restaurants, cafeterias and *bukas* (open roadside eateries) in Port Harcourt.

Individuals outside the eligibility criteria as well as pregnant women were exempted due to possible physiological changes in their cardiovascular and respiratory systems. Similarly, cooks with pre-existing pulmonary diseases like asthma, chronic bronchitis, and emphysema, as well as those undergoing treatment for hypertension, heart disease or dyslipidemias, were excluded, given the potential confounding effects on the parameters under investigation.

Data Collection Tools and Technique

In this study, key socio-demographic attributes comprising age, gender, marital status, ethnicity, religion, income level, and educational qualifications as well as the cardio-pulmonary indices of every participant was documented using a structured proforma and specified standard method and devices.

Blood pressure Measurement:

Hypertension was categorised using the current guideline cut-off of >130/80mmHg (WHO, 2023).

Blood Pressure (BP) and heart rate measurements were collected from each study participant using a digital sphygmomanometer with adult's cuff sizes was used in this measurement.

i. The participants were asked to sit on a chair with their feet flat on the floor and relax for a minimum of five (5) minutes.
ii. The arm was rested on the table at the level of the heart.
iii. The blood pressure cuff was wrapped around the top of the arm with the bottom of the cuff above the elbow.
iv. The device was switched on and automatically provided the result in approximately one minute.
v. Results were recorded to the data collection form in mmHg for blood pressure and bpm for heart rate.

Pulmonary function:

Following standard guidelines, the pulmonary indices measured included: forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), FEV1/FVC ratio, forced expiratory flow 25–75% (FEF25–75), and peak expiratory flow rate (PEFR). Measurements were obtained using calibrated electronic spirometer (MIR Spirobank II Smart) with daily calibration checks to ensure quality. Spirometry techniques standardised for posture, nose clips, mouthpieces, operator instructions and repeat attempts minimised errors. Criteria for test acceptance and repeatability adhered to guidelines with reference norms customised for age, gender and ethnicity. The protocol minimises systematic biases and enables generalizability. It allows detailed investigation of early lung function declines conferring NCD risk attributable to chronic exposure to biomass cooking fumes.

Spirometry Procedure—The procedure for using the electronic spirometer followed thus:

i. The subject sat upward and straight
ii. The spirometer mouth piece was held tightly with lips
iii. The subject did not block mouth piece with tongue
iv. Then the subject inhaled slowly and deeply through the mouthpiece to raise the indicator
v. When the subject could not inhale any longer, the mouthpiece was removed and the subject was told to hold breath for at least 3 seconds
vi. The subject exhaled normally
vii. Steps were repeated three times to get an average reading

Lipid Profile Screening:

i. Five (5) millilitres of peripheral fasting venous blood was collected aseptically from the antecubital vein with a sterile disposable 5ml syringe and dispensed into labelled vacutainer lithium heparin tubes for all participants.
ii. The samples were centrifuged at 4000 revolutions per minute (rpm) for five minutes.
iii. Each separated serum sample was then tested for biochemical analysis of lipid profile.

The laboratory screening of lipid profile was done using Spectrophotometeric technique (Sug, Spec, Engl; 23P, 2013) as stated by Schaefer *et al.,* (2016) as well as being guided by the reagent kits manufacturer's manual.

Data Analysis

The Statistical Package for Social Sciences (SPSS version 25.0) was used for data analysis. Quantitative variables were expressed as mean (±standard deviation), while categorical variables were presented as frequencies and percentages.

Ethical Considerations

Ethical clearance was sought and obtained from the Faculty of Basic Medical Sciences Research Ethics Committee of the Rivers State University prior to the commencement of the study. Similarly, administrative permissions were also obtained from local municipal authorities and the managements of the respective cooking establishments surveyed in Port Harcourt. Just before obtaining written informed consent from each participant, the study coordinator made known to all participants, the study purpose, protocols, requirements, and potential risks/benefits. Confidentiality of collected information was maintained throughout by assigning mere codes as subjects' identity. Collected data was securely accessible only to direct study investigators stored password-protected databases.

3. RESULTS

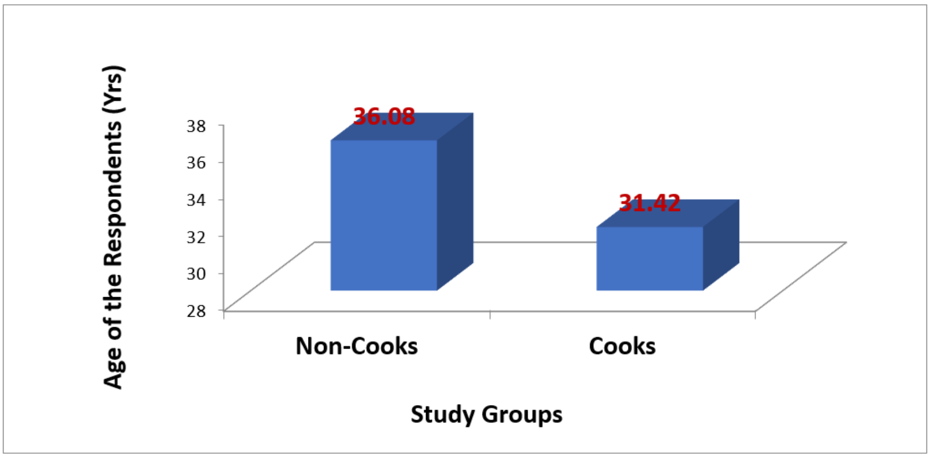

Figure 1: Age of the Respondents

Values represent mean ± SD, n=50; a Significant at $p<0.05$ when mean values of Cooks are compared to that of Non-Cooks; BMI= Body Mass Index.

Figure 1 shows the mean ages of the study's respondents, who are made up of Cooks and non-cooks. The cooks had a relatively lower mean age (31.42yrs) compared to that of the non-cooks (36.08yrs).

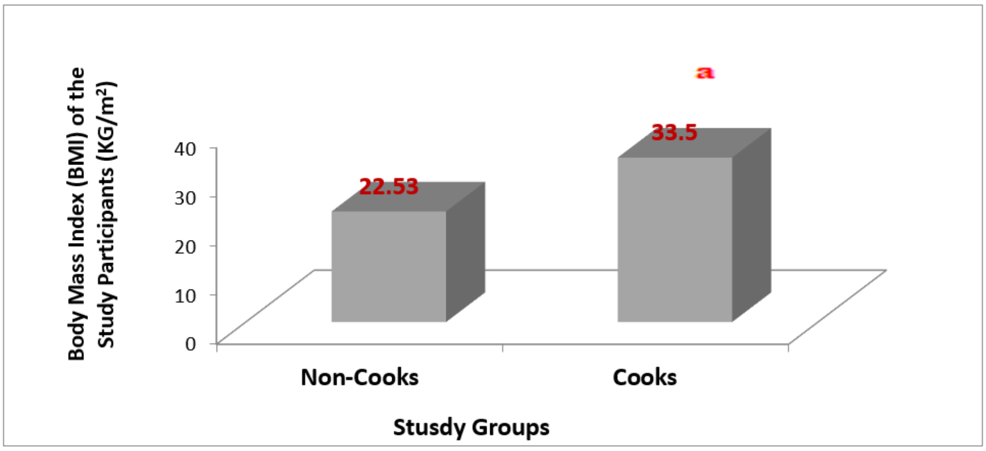

Figure 2: Body Mass Index (BMI) of the Study Participants

Values represent mean ± SD, n=50; a Significant at $p<0.05$ when mean values of Cooks are compared to that of Non-Cooks; BMI= Body Mass Index.

Figure 2 displays the body mass index (BMI) of the study participants. The mean BMI of the cooks was seen to be significantly (P0<0.05) raised when compared to that of the non-cooks.

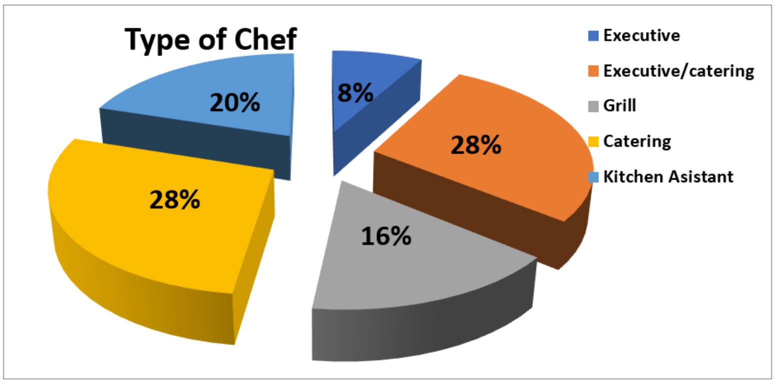

Figure 3: Categories Chef of the Study Participants

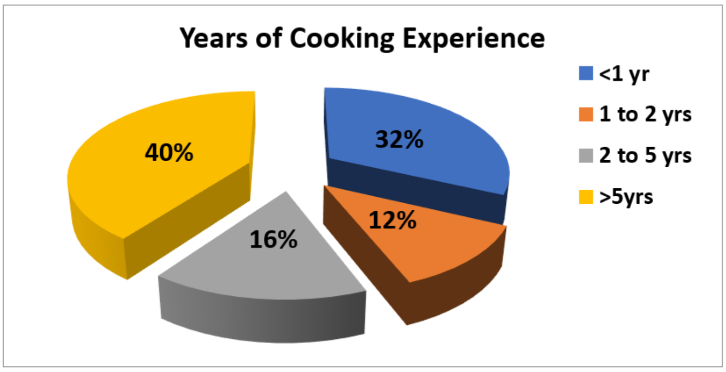

Figure 4: Years of Cooking Experience across the Study Participants

Table 1: Effects of cooking fumes on lipid profile among cooks in Port Harcourt

Study Groups	TC (mmol/L)	TG (mmol/L)	HDL-C (mmol/ L)	LDL-C (IU/L)
Non-Cooks	3.93 ± 0.46	0.93 ± 0.15	2.63 ± 0.45	1.06 ± 0.22
Cooks	3.85 ± 1.04 [a]	1.63 ± 0.51 [a]	1.30 ± 0.37 [a]	2.31 ± 0.77 [a]

Values represent mean ± SD, n=50; a Significant at $p<0.05$ when mean values of Cooks are compared to that of Non-Cooks; TC=total cholesterol; TG=triglyceride; HDL-C=high density lipoprotein cholesterol; LDL-C=Low density lipoprotein cholesterol.

In Table 1, the result of the effects of cooking fumes on lipid profile among cooks in Port Harcourt is shown. The mean levels of TC and HDL-C of the cooks were seen to be significantly (P<0.05) reduced when compared to those of the non-cooks. On the other hand, the mean levels of both TG and LDL-C in the cooks were significantly (P<0.05) elevated when compared to those of the non-cooks.

Table 2: Effects of cooking fumes on Atherogenic Profile among cooks in Port Harcourt

Study Groups	Atherogenic Index of Plasma (AIP)	Atherogenic coefficient (AC)	Castelli risk index (CRI-1)
Non-Cooks	-0.13 ± 0.23	2.80 ± 0.73	3.80 ± 0.73
Cooks	0.12 ± 0.26	2.13 ± 1.04 [a]	3.08 ± 1.08 [a]

Values represent mean ± SD, n=50; [a] Significant at $p<0.05$ when mean values of Cooks are compared to that of non-cooks; The data on Table 2 indicates the effects of cooking fumes on atherogenic profile among cooks in Port Harcourt.

Although not significantly (P>0.05), the AIP level was comparatively high in the cooks with respect to the non-cooks. Surprisingly, the mean values of the AC and CRI-1 in the cooks were seen to be significantly (P<0.05) lower compared to those of the non-cooks.

Table 3: Effects of cooking fumes on blood pressure parameters among cooks in Port Harcourt

Study Groups	Blood Pressure Parameters		
	Systolic Blood Pressure (SBP) (mmHg)	Diastolic Blood Pressure (DBP) (mmHg)	Mean Arterial Pressure (MAP) (mmHg)
Non-Cooks	116.00 ± 9.26	73.60 ± 7.76	87.46 ± 8.66
Cooks	135.48 ± 26.16 [a]	83.28 ± 15.12 [a]	100.58 ± 18.50 [a]

Values represent mean ± SD, n=50; [a] Significant at $p<0.05$ when mean values of Cooks are compared to that of non-cooks; Table 3 indicates the effects of cooking fumes on blood pressure parameters among cooks in Port Harcourt.

All measured blood pressure parameters (SBP, DBP and MAP) were significantly (P<0.05) elevated in the cooks compared to those of the non-cooks.

Table 4: Effects of cooking fumes on some pulmonary parameters among cooks in Port Harcourt

S/N	Parameters	Study Groups	
		Non-Cooks	Cooks
1.	**FVC (l/s)**	1.65 ± 0.08	1.89 ± 0.66 [a]
2.	**FEV1 (l/s)**	1.29 ± 0.07	1.85 ± 0.63 [a]
3.	**FEV6 (l/s)**	1.65 ± 0.08	1.93 ± 0.60 [a]
4.	**FEV1/FVC (%)**	78.37 ± 5.27	98.63 ± 4.46 [a]

Values represent mean ± SD, n=50; [a] Significant at $p<0.05$ when mean values of Cooks are compared to that of non-cooks; Table 4 shows the result on the effects of cooking fumes on some pulmonary parameters among cooks in Port Harcourt.

All measure pulmonary parameters by the current study were seen to markedly raised in the cooks when compared to those of the non-cooks.

4. DISCUSSION

Occupational safety and the associated health risks are a significant impact of expanding industrialization and various occupations in the labor market. Aside from the long hours/physically demanding tasks, exposure to harmful chemicals, fumes, and other hazards put workers at risk of illness and injury (Caruso *et al.,* 2006; Tulchinsky *et al.,* 2014). Maintaining and ensuring the global standard of workplace safety and health is not only critical, but will also result in a highly productive and beneficial workplace for all (Joshi *et al.,* 2011).

Exposure to cooking fumes may have different deleterious effects on the respiratory system. The aim of this study was to look at possible effects from inhalation of cooking fumes on pulmonary function (Svedahl *et al.,* 2009). Therefore, the present study evaluated work-related respiratory, lipid profile and blood pressure impacts on cooks in our population.

The major findings of the present study are presented here and discussed as well.

Considering the outcome of the present study, especially how the cooks with a relatively lower mean age (compared to the non—cooks) had higher BMI levels that fell with obese class I. I

BMI has been reported to have a significant, positive, and very strong correlation with biological age; in fact, the higher the BMI value, the older the biological age (Wahyuni *et al.,* 2022); but the above result of the present study was opposite this established notion. It thus, implies that could be an underlying factor possibly associated with the occupation of the cooks that may be predisposing them to obesity as compared to the older non-cooks. Such a factor may definitely not be physiologically beneficial.

In another related finding of the present study, the mean values of HDL-C of the cooks were seen to be significantly reduced when compared to those of the non-cooks, while the levels of both TG and LDL-C in the cooks were remarkably elevated when compared to those of the non-cooks.

Aside from the suspicion of frequently tasting meals cooked with oil and lipids, Ihim *et al.,* (2016) reported that prolonged exposure to gas flares and the likes may contribute to increased dyslipidemia and that such may increase the prevalence of cardiovascular. It is obvious that long exposure to the cooking profession may predispose women to possible cardiovascular challenges. There is thus the need for caution and application of more safety practices in this profession as to mitigate such undesirable outcome.

The present study also found that cooking fumes effects on atherogenic profile among the cooks indicated a non-significantly raised AIP level in the cooks, although AC and CRI-1 were markedly low in them as well. While the AIP level corroborates with lipid profile of the cooks, the AC and CRI-1 may not be very reliable in evaluating the possible associated risk due to occupational dangers of the cooks.

Considering the result of the present study on the possible effects of cooking fumes on blood pressure parameters among the cooks, it was found that all measured blood pressure parameters (SBP, DBP and MAP) had significantly elevations in the cooks compared to those of the non-cooks.

Of course, it is known that dyslipidemia may be indicated by raised levels of serum total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), or a decreased serum high-density lipoprotein cholesterol (HDL-C) concentration (Cífková and Krajčoviechová, 2015). This was virtually the outcome of the lipid profile of the cooks in this study, thus indicating a possible dyslipidemic status in the cooks. Further, dyslipidemia has been severally linked to many cardiovascular disease (CVD) (Garg *et al.,* 2015; Kutkiene *et al.,* 2018; Hedayatnia *et al.,* 2020). It could thus, be risk factor for possible cases of CVD in the cooks. It is suggestive to state that the cooks as evaluated by this study may be predispose to CVDs possibly due to their occupation.

The present study also did pulmonary function test on the subjects and found remarkably raised Forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), and FEV1/FVC ratio. This outcome is suggestive of a possible obstructive or restrictive lung disorders in the cooks. The above parameters are the most clinically helpful indices obtained from spirometry (Duke, 2011). Although spirometry demonstrates airflow limitations, it does not determine the cause (e.g., airway obstruction versus decreased alveolar elastic recoil versus decreased muscle strength). It is also effort dependent and requires a motivated patient. Thus, a differential or further evaluation may be recommended to understand the actual impact of dangerous factors in cooking profession and its operators

5. CONCLUSION

These findings have shown that the health impact of airborne chemicals and particulate matter from cooking fumes may not only cause mere irritation of the eyes, nose, and throat, as well as headaches, etc., but could lead or predispose subjects to obesity, dyslipidemia, cardiovascular disorders and restrictive or obstructive lungs disorders in the cooks.

REFERENCES

- Caruso, C. C., Bushnell, T., Eggerth, D., Heitmann, A., Kojola, B., Newman, K., ... & Vila, B. (2006). Long working hours, safety, and health: toward a National Research Agenda. *American journal of industrial medicine*, *49*(11), 930-942.
- Cífková, R., & Krajčoviechová, A. (2015). Dyslipidemia and cardiovascular disease in women. *Current cardiology reports*, *17*, 1-10.
- Duke, J. (2011). *Anesthesia secrets*. Elsevier Health Sciences.
- Garg, R., Aggarwal, S., Kumar, R., & Sharma, G. (2015). Association of atherosclerosis with dyslipidemia and co-morbid conditions: A descriptive study. *Journal of natural science, biology, and medicine*, *6*(1), 163.
- Hedayatnia, M., Asadi, Z., Zare-Feyzabadi, R., Yaghooti-Khorasani, M., Ghazizadeh, H., Ghaffarian-Zirak, R., ... & Ghayour-Mobarhan, M. (2020). Dyslipidemia and cardiovascular disease risk among the MASHAD study population. *Lipids in health and disease*, *19*, 1-11.
- Hiller, J., Greiner, A., & Drexler, H. (2022). Respiratory afflictions during hairdressing jobs: case history and clinical evaluation of a large symptomatic case series. *Journal of Occupational Medicine and Toxicology*, *17*(1), 1-11.
- Ihim Augustine, C., Okeke Chizoba, O., Manafa Patrick, O., Ezejindu Damian, N., & Obi Patrick, C. (2016). Effect of Exposure To Soot On Troponin I And Lipid Profile Levels. *European Journal of Biomedical*, *3*(2), 05-10.
- Joshi, S. K., Shrestha, S., & Vaidya, S. (2011). Occupational safety and health studies in Nepal. *International Journal of Occupational Safety and Health*, *1*(1), 19-26.
- Kutkiene, S., Petrulioniene, Z., Laucevicius, A., Matuzeviciene, G., Kasiulevicius, V., Petrulionyte, E., ... & Rinkuniene, E. (2018). Cardiovascular risk profile of patients with atherogenic dyslipidemia in middle age Lithuanian population. *Lipids in health and disease*, *17*(1), 1-7.
- Svedahl, S., Svendsen, K., Qvenild, T., Sjaastad, A. K., & Hilt, B. (2009). Short term exposure to cooking fumes and pulmonary function. *Journal of Occupational Medicine and Toxicology*, *4*, 1-8.
- Tulchinsky, T. H., & Varavikova, E. A. (2014). Environmental and occupational health. *The New Public Health*, 471.
- Wahyuni, S., Nauli, F., Farras, R. M., Sari, J., Rofi, M. R. B. N., Okvalita, I., & Fathony, M. L. (2022). Correlation Between Body Mass Index and Biological Age in Young Adults. *Nusantara Science and Technology Proceedings*, 63-65.
- CDC [Centre for Disease Control] Prevention, S. O. A. F., & Schools, H. (2015). CDC. *Atlanta, GA, USA*, 7-12.
- Chan CC, Lin LY, Lai CH, Chuang KJ, Wu MT, Pan CH. Association of particulate matter from cooking oil fumes with heart rate variability and oxidative stress. Antioxidants. 2021 Aug 23;10(8):1323.
- Filippelli C, Verso MG, Amicarelli V, Di Famiani M, Tomei G, Pimpinella B, Casale T, Capozzella A, Ciarrocca M, Rosati MV, Tomei F. Mense e personale addetto alle cucine: valutazione dei rischi occupazionali [Food service workers and cooks: occupational risk assessment]. Ann Ig. 2008 Jan-Feb;20(1):57-67. Italian. PMID: 18478677.
- Hao, M., & Nie, Y. (2022). Hazard identification, risk assessment and management of industrial system: Process safety in mining industry. *Safety science*, *154*, 105863.
- Juntarawijit Y, Juntarawijit C. Cooking smoke exposure and respiratory symptoms among those responsible for household cooking: A study in Phitsanulok, Thailand. Heliyon. 2019 May 1;5(5).
- Neghab M, Delikhoon M, Baghani AN, Hassanzadeh J. Exposure to cooking fumes and acute reversible decrement in lung functional capacity. The international journal of occupational and environmental medicine. 2017 Oct 1;8(4):207.
- Noosorn N, Manoton A, Robin RC. Social measures for reducing exposure to secondhand smoke in migrant workers of sugarcane harvest in the lower northern region of Thailand. Tobacco Induced Diseases. 2021 Sep 23;19:73.
- Olamide O, Adebayo O, Emmanuel A, Eyitayo L, Beatrice O, Tomisin M. Prevalence and Risk Factors of Cardiovascular Diseases among the Nigerian Population: A New Trend among Adolescents and Youths [Internet]. Novel Pathogenesis and Treatments for Cardiovascular Disease. IntechOpen; 2023. Available from: http://dx.doi.org/10.5772/intechopen.108180
- Oliveira MD, Lopes DF, Bana e Costa CA. Improving occupational health and safety risk evaluation through decision analysis. International Transactions in Operational Research. 2018 Jan;25(1):375-403.
- Papadopoulos G, Georgiadou P, Papazoglou C, Michaliou K. Occupational and public health and safety in a changing work environment: An integrated approach for risk assessment and prevention. Safety science. 2010 Oct 1;48(8):943-9.
- Rim KT. Toxicity of cooking oil fumes and prevention of occupational diseases: a literature review. Toxicology and Environmental Health Sciences. 2023 Jun;15(2):101-8.
- Schaefer EJ, Tsunoda F, Diffenderfer M, Polisecki E, Thai N, Asztalos B. The measurement of lipids, lipoproteins, apolipoproteins, fatty acids, and sterols, and next generation sequencing for the diagnosis and treatment of lipid disorders. Endotext [Internet]. 2016 Mar 29.
- Svedahl SR. Cooks, work environment and health: Experimental studies of exposure to cooking fumes, and epidemiological investigations in a cohort. 2018.

- Ural, S., & Demirkol, S. (2008). Evaluation of occupational safety and health in surface mines. *Safety Science*, *46*(6), 1016-1024.
- Wang C, Liu L, Liu X, Chen W, He G. Mechanisms of lung cancer caused by cooking fumes exposure: a minor review. Chinese Medical Sciences Journal. 2017 Sep 1;32(3):193-7.
- WHO [World Health Organization. Cardiovascular Diseases (CVDs)]. 2009. Available from: http://www. who. int/mediacentre/factsheets/fs317/en/index. html [Accessed: 27 April 2025].
- WHO [World Health Organization]. Hypertension. 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension [Accessed: 27 April 2025].