KORESPONDENSI JURNAL

Judul Artikel : The Renal Function Status of Metal Electroplating Workers Exposed To Chromium VI

Nama Jurnal : Malaysian Journal of Public Health Medicine

Penulis : 1. **Yuliani Setyaningsih**
2. Ida Wahyuni
3. Ekawati
4. Praba Ginandjar

No	Kegiatan	Tanggal	Keterangan	Halaman
1	Submission Acknowledgement	25 November 2020	E-mail	2-3
2	Revisions Required	4 Januari 2021	E-mail, File	4-19
3	Editor Decision	20 Januari 2021	E-mail, File	20-27
4	Pengiriman hasil review	22 Januari 2021	E-mail	28
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6	Editor decision : accepted	1 April 2021	E-mail	30-31
7	Notification	6 April 2021	E-mail	32

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[MJPHM] Submission Acknowledgement

Professor Dato' Dr. Syed Mohamed Aljunid <saljunid@gmail.com> 25 November 2020 pukul 01.50
Kepada: Yuliani Setyaningsih <yulianisupomo71@gmail.com>

Yuliani Setyaningsih:

Thank you for submitting the manuscript, "METAL ELECTROPLATING WORKERS' RENAL FUNCTION WHEN EXPOSED TO CHROMIUM IN RELATION TO AGE, LENGTH OF EMPLOYMENT, AND NUTRITIONAL STATUS" to Malaysian Journal of Public Health Medicine. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Submission URL: http://mjphm.org/index.php/mjphm/authorDashboard/submission/863
Username: yulianisetyaningsih01

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Assist. Prof. Dr. Abed Al-abed
Editorial Assistant
Malaysia Journal of Public Health Medicine

Malaysian Journal of Public Health Medicine

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Statement in OJS is "Review is overdue", OJS username:yulianisetyaningsih01

yuliani setyaningsih <yulianisupomo71@gmail.com> 28 Desember 2020 pukul 23.45
Kepada: editor@mjphm.org.my

Dear
Dr. Abed and Joyce M Encluna
Editor in Chief Malaysian Journal of Public Health Medicine (MJPHM)

Hello, my name is Dr.Yuliani Setyaningsih, SKM, M.Kes from Faculty of Public Health Diponegoro University, Indonesia.
On 24th November 2020 I submitted my article entitled "Metal Electroplating Workers' Renal Function when Exposed to Chromium in Relation to Age, Length of Employment, and Nutritional Status" to Malaysian Journal of Public Health Medicine with username :yulianisetyaningsih01.
Then in the beginning of December, Open Journal Systems said "Awaiting Responses from Reviewers" but now it says "Review is Overdue".
Could you please explain more about the statement "Review is overdue" ? And may I know is there something that I need to do about this?
Thank you in advance

Best Regards,

Dr.Yuliani Setyaningsih, SKM, M.Kes
Faculty of Public Health Diponegoro University
Indonesia

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[MJPHM] Editor Decision

Fikri Rosely <fikrirosely4@gmail.com> 4 Januari 2021 pukul 21.09
Kepada: Yuliani Setyaningsih <yulianisupomo71@gmail.com>, Ida Wahyuni <idawahyuni@live.undip.ac.id>, Ekawati <ekawati@live.undip.ac.id>, Praba Ginandjar <prabaginandjar@live.undip.ac.id>

Yuliani Setyaningsih, Ida Wahyuni, Ekawati, Praba Ginandjar:

We have reached a decision regarding your submission to Malaysian Journal of Public Health Medicine, "METAL ELECTROPLATING WORKERS' RENAL FUNCTION WHEN EXPOSED TO CHROMIUM IN RELATION TO AGE, LENGTH OF EMPLOYMENT, AND NUTRITIONAL STATUS".

Our decision is: Revisions Required

Assist. Prof. Dr. Abed Al-abed
Editorial Assistant
Malaysia Journal of Public Health Medicine

Reviewer A:

Congratulation to the researchers as the research topic is very interesting. A few points the author/s need to rectify/clarify

1. Illustrate the sampling method. How the participants were selected and what are the inclusion and exclusion criteria.
2. The method of measuring the Hight and The Weight to get the BMI and the tools used for that. Which appliances were used and the method of measurements?
3. The method used to measure the Cr VI in the urine should be elaborated in details. Even if the analysis was carried out by a private lab, state the reference so the future researchers learn.
4. Details on the assessment method used to assess the nutritional status of the workers.

Recommendation: Resubmit for Review

Reviewer B:

- The samples collected and recruited were not clear. Thus, the results will produce potential biased and challenging to convey reliable results. This is because the study was unable to validate the high value of Cr in urine due to exposure of Cr during work or any other factors.
- Based on previous studies, Pan et al. (2017) provided for the exclusion criteria in their study (page 2). The study conducted by Sudarsana et al. (2013) also provides exclusion criteria (page 35).
- The procedures were not sufficient detail, and this will affect the results and discussion. And, the conclusion also becomes unreliable.
- Cross-checked references guidelines in MJPHM webpage.

Recommendation: Revisions Required

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MALAYSIAN JOURNAL OF PUBLIC HEALTH MEDICINE (MJPHM)

EVALUATION FORM

Title & ref. no.: … 863 - METAL ELECTROPLATING WORKERS' RENAL FUNCTION WHEN EXPOSED TO CHROMIUM IN RELATION TO AGE, LENGTH OF EMPLOYMENT, AND NUTRITIONAL STATUS

Kindly fill in this form as accurate as possible. Thank you for your kind cooperation.

TOPIC/SECTION	ACCEPTABLE*	COMMENTS+
Title	**Too lengthy .. can be shortened…**	The suggested title **"The renal function status of metal electroplating workers exposed to chromium VI"**
Abstract	**Acceptable**	**No comments**
Introduction	**Acceptable**	**No comments**
Methodology - Population - Sampling & Sample - Data Collection - Data Analysis - Definition	1. Line 8: 2. No clear information about the sampling method. 3. Study tools need to be mentioned. 4. No clear method used to assess the Cr VI in the urine. 5. How the nutritional status of the workers was assessed?	1. Were to was 2. Illustrate the sampling method. 3. The method of measuring the Hight and The Weight to get the BMI and the tools used for that. 4. The method used to measure the Cr VI in the urine should be elaborated in details. Even if the analysis was carried out by a private lab. State the reference. 5. Details on the assessment method used to assess the nutritional status of the workers.
Results	Acceptable	No comments

- Descriptive - Analytic / Hypothesis - Testing - Data Presentation = Tables, figures etc		
Discussion - Magnitude/Consistency - Cause-effect relationship - Bias / Limitation	Acceptable	No comments
Conclusion	Acceptable	No comments
References - Format MJPHM	The list seems fine and following the format.	To add single space between each reference in the list.

- * *Tick √ if Yes and X if No*
-
- + *Give your expert opinion on the matter, use separate sheets if necessary*

Detail Comments (please advise the authors on how to improve their paper)

Congratulation to the researchers as the research topic is very interesting. A few points the author/s need to rectify/clarify

1. Illustrate the sampling method. How the participants were selected and what are the inclusion and exclusion criteria.
2. The method of measuring the Hight and The Weight to get the BMI and the tools used for that. Which appliances were used and the method of measurements?
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4. Details on the assessment method used to assess the nutritional status of the workers.

RECOMMENDATION (tick √)

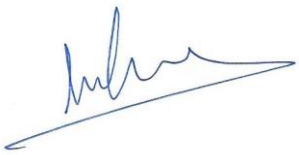
= Accepted for publication (with minor corrections)

☐ = Accepted for publication (after major corrections)

☐ = To be resubmitted

☐ = To be rejected

SIGNATURE



(Dr Mohammed Abdulrazzaq Jabbar)

METAL ELECTROPLATING WORKERS' RENAL FUNCTION WHEN EXPOSED TO CHROMIUM IN RELATION TO AGE, LENGTH OF EMPLOYMENT, AND NUTRITIONAL STATUS

ABSTRACT

Chromium (Cr) is commonly used as an anti-corrosive agent. Due to its unique nature, Cr is used to coat metal in order to make it looks shiny and attractive. However, hexavalent chromium (Cr (VI)), a form of chromium used in electroplating, is classified as carcinogenic substance. Its portal of entry into the human body can be through inhalation, ingestion, and dermal absorption. Talang District in central-Java, Indonesia is a center of informal sector's metal electroplating industry. Electroplating workers in the informal sector rarely wear personal protective equipment (PPE) while working. This research analyzed the relation between chromium exposure, age, length of employment, and nutritional status with renal function of metal electroplaters. The subjects of this study involved 35 electroplaters from Talang with working experience ranging between 6 and 40 years. The independent variables were age, length of employment, nutritional status and exposure to chromium. Dependent variable was workers' renal function. Urine samples were collected to determine chromium exposure and renal function based on urinary chromium and creatinine levels. Data was analyzed using chi-square test with SPSS Statistics software. The average urinary chromium and creatinine levels were 21.16 µg/L and 209.75 mg/dL respectively. This study found no relation between age and chromium levels in urine and renal function. However, length of employment and nutritional status were found to be significantly related to renal function. Although chromium exposure does not appear significantly associate with renal function, the average urinary chromium levels of metal electroplaters did exceed threshold values.

Keywords: chromium, electroplating workers, renal function

INTRODUCTION

Indonesia's informal sector consists of many workers but it comes with relatively high occupational health risk associated with it. One field with known risks is the electroplating services and metal coating process field, in which metal appliances are coated with Cr in order to make them stainless and give them a shiny white appearance.

The chromium used during the metal coating process can also pollute the air in the working environment in a form of mist coming from air bubble in the anode and cathode reactions happened in the coating pool. Cr (VI), a form of chromium used in electroplating and metal coating is included in the big group of chemical material with various chemical characteristics, utilization, and exposure in the working place.[1,2] It is known to be carcinogenic when enters the body particularly through the inhalation resulting not only adverse effect in the respiratory tract but also liver and kidneys organs[3-5].

One of the negative effects is causing renal function disorders[6]. A research of 178 electroplating workers reported renal impairment in nearly 23 % of the subjects[6]. A study in Tegal Indonesia in 2013 found that in the informal sector, Cr level in the air and water at electroplating workplaces were above the recommended threshold value.[7] Furthermore, studies of electroplaters in informal

Comment [L1]: What does it mean?

Comment [L2]: Chromium (Cr)

Comment [L3]: Chromium Hexane (Cr (VI))/ Chromium (6+)

Comment [L4]: This is not a suitable term.

Comment [L5]: How this happened – how about Cr (VI) is reduced to its lower oxidation states

sector showed that majority of the workers do not wear any personal protective equipment such as mask, gloves, and work outfit[7,8].

Creatinine levels in blood and urine can be used in the assessment of renal function disorders[9]. High serum creatinine or urine creatinine values can be indication of renal function disorders, serum creatinine and urine creatinine checkup can be used to measure the ability of glomerular filtration rate. Besides showing that chromium exposure in the air and water which were above recommended threshold, Sudarsana also showed a connection between chromium exposures and renal dysfunction among electroplaters in Talang District, Indonesia[7]. This research proposes different biomarker namely non-invasive sample collection of urine for determining chromium and creatinine levels. Moreover, to paint more complete picture, this study also considers individual characteristic of electroplaters that may show correlation between Cr exposure and their renal function.

METHOD

This was an observational analytic quantitative study with cross sectional design[10]. The population in this research was all electroplating workers in Talang. The subjects of this study were 35 electroplating workers with more than one year working experience and never change their occupations. The respondents' urinary chromium and creatinine levels and certain characteristics were determined. These characteristics are age, length of employment and Body Mass Index (BMI) as the indicator of nutritional status. Chromium level in the urine was analyzed using Atomic Absorption Spectroscopy (AAS). Urinary creatinine test were used to determine renal function of the workers. Urine sample were drawn on spot, 4 hours after electroplaters start working and urine samples were kept in an icebox then directly delivered to the laboratory to be analyzed. A Chi square test using SPSS Statistics Software was conducted to determine the relation between the workers' age, length of employment, nutritional status, and chromium exposure toward renal function of the workers.

The ethical clearance was requested and was approved by The Health Research Ethics Committee, Public Health Faculty, Diponegoro University filed under 116/EC/FKM2018.

RESULTS

When the data were taken, almost all of the workers did not use personal protective equipments during their working hours, whether mask, gloves, rubber boots, even the long sleeved clothes. All of the workers are men and work for 8 hours a day and 40 hours a week. Table 1 shows that more than half of workers were ≥ 40 years old. The average age was 39 years (SD 6.29) with the youngest of 25 years old and the oldest worker was 56 years old. Length of employment was 6 years until 40 years with 18 workers (51.4%) had been working for ≥ 19 years. Most of the workers (65.7%) had normal BMI and 17.1% were overweight. Majority of workers (51.4%) had chromium level in urine above Biological Exposure Indices (BEI) 10 µg/L with average 21.38 µg/L. The lowest level of chromium in the urine was found 3.50 µg/L and the highest level was 145.34 µg/L. Dominantly of workers had normal level of creatinine in urine (77.1%) with average level of creatinine in urine was 210.17 mg/dL. The highest level of creatinine in urine was 479 mg/dL and the lowest level of creatinine was 28.00 mg/dL.

Comment [L6]: All of sudden, the explanation starts with creatine level. It is advice to briefly explain what is creatine.

Comment [L7]: Replace with straight forward words

Comment [L8]: Combine and simplify the sentences.

Comment [L9]: What is this? Advice to re-write the sentence

Comment [L10]: Briefly explain how the workers are selected for the study. What are the factors of inclusion and exclusion? For example, workers who consume any heavy metal products within 3 months should be avoided from participating in the study. And, provide any exclusion criteria to make the study more reliable.

Comment [L11]: Specify the AAS model; why use AAS instead of ICP-MS, since ICP-MS was found to produce accurate results for the detection of heavy metals and does not require the preparation of a standard calibration solution.

Method validation:
Before running the sample in the AAS, the researcher needs to prepare calibration standard for Cr that considers a linear regression value of 0.994 to 0.999. Is this factor considered before the urine samples are tested?

Comment [L12]: Provide the AAS plotting graph from the software (eg. PinAAcle 500 - optional Syngistix™) to show Cr results in urine samples.

Comment [L13]: Is it refer to the American Conference of Governmental Industrial Hygienists (ACGIH)?

Comment [L14]: Does the value of 10 µg/L refer to a government or industry advisory board; provide reference.

Comment [L15]: The results cannot well discuss since no inclusion and exclusion criteria have been explained in the method. The result may also be due to samples consuming supplements containing heavy meta ...

Comment [L16]: The information is already provided in Table 1. The explanation is just to highlight the important finding from Table 1.

Table 1. The Characteristics Distribution of Metal Electroplating Workers in Talang District

Variables	n (%)	Mean	Median	SD	min-max
Age					
≥40 years old	15(42.9)	39.69	39.00	6.29	25-56
<40 years old	20(57.1)				
Length of Employment					
≥ 19 years	18(51.4)	18.86	19.00	7.19	6-40
< 19 years	17(48.6)				
Nutritional Status(BMI)					
Severely Underweight	1 (2.9)	23.04	23.01	3.82	15.91-34.23
Underweight	2 (5.7)				
Normal	23(65.7)				
Overweight	6 (17.1)				
Obese	3 (8.6)				
Chromium level in the urine					
≥ 10 µg/L	18(51.4)	21.38	10.13	30.89	3.50-145.34
< 10 µg/L	17(48.6)				
Creatinine Level in the urine					
Abnormal	8(22.9)	210.17	207.00	105.32	28.00-479.00
Normal	27(77.1)				

Table 2 describes age in relation to renal function of metal electroplating workers. We found there was no difference in renal function capacity between workers who were at least 40 years old and those < 40 years old (p=0.700).The amount of workers with abnormal renal function was equally divided between workers at least 40 years old and those younger than 40 years.

Table 2. Age in Relation to Renal Function of Metal Electroplating Workers in Talang District

Age	Renal Function				Total	%
	Abnormal		Normal			
	f	%	f	%		
≥40 years old	4	26.67	11	73.33	15	100
<40 years old	4	20.00	16	80.00	20	100

P = 0.700; RP = 1.333; 95 % CI = 0.396-4.487

As shown in Table 3 there was found association between working period and renal function capacity (p=0.041). There were 7 (38.89%) workers in at least 19 years working period group who had abnormal renal function compared to <19 years working period group which only had 1 (5.88%) worker who had abnormal renal function. Moreover there were more workers in <19 years working period group who had normal renal function (94.12%) compared with workers who had worked for ≥19 years (61.11%).

Table 3. Length of Employment in Relation to Renal Function of Metal Electroplating Workers in Talang District

Working Period	Renal Function				Total	%
	Abnormal		Normal			
	f	%	f	%		
≥19 years	7	38.89	11	61.11	18	100
<19 years	1	5.88	16	94.12	17	100

P = 0.041; RP = 6.611; 95 % CI = 0.906-48.252

Relation between nutritional status and renal function capacity of metal electroplating was found with p = 0.038 (Table 4). There were more overweight workers who had abnormal renal function (46.15%) compared to workers with normal (10.53%) and underweight (0%) BMI status. In contrary, all 3 workers with underweight nutritional status (100%) and majority of workers with normal BMI as many as 17 workers (89.47%) had normal renal function capacity and 7 workers (53.85%) with category of overweight had normal renal function.

Table 4. Nutritional Status (BMI) in Relation to Renal Function of Metal Electroplating Workers in Talang District

Nutritional Status (BMI)	Renal Function				Total	%
	Abnormal		Normal			
	f	%	f	%		
Underweight	0	0	3	100	3	100
Normal	2	10.53	17	89.47	19	100
Overweight	6	46.15	7	53.85	13	100

P = 0.038

Regarding chromium level in urine, it was found no relation between renal function and chromium level in urine (p=0.909). As shown in table 5 there were more workers who had chromium level < 10.13 µg/L with abnormal renal function (35.29%) compared with workers with ≥ 10.13 µg/L chromium level with abnormal renal function (27.78%). Furthermore, majority of workers with Cr level above and under 10.13 µg/L had normal renal function as many as 13 workers (72.22%) and 11 workers (64.71%) respectively.

Table 5. Urinary Chromium Level in Relation to Renal Function of Metal Electroplating Workers in Talang District

Chromium Level	Renal Function				Total	%
	Abnormal		Normal			
	f	%	f	%		
≥ 10.13 µg/L	5	27.78	13	72.22	18	100
< 10.13 µg/L	6	35.29	11	64.71	17	100

P = 0.909 ; RP = 0.787; 95% CI = 0.294-2.106

DISCUSSION

Previous research confirmed that the industrial electroplating workers were exposed to Cr (VI)[7,11]. The average amount of urinary chromium exceeding the threshold limit value was lower than the average found in a study by Sudarsana[7]. Related to this study, workers were found working without any PPE while a study of

Comment [L17]: Since there are no exclusion criteria for the samples. The study cannot identify the high value of Cr in urine due to exposure to of Cr during work or other factors. Article written by Pan et al. (2017) provided for the exclusion criteria in their study (page 2). The study conducted by Sudarsana et al. (2013) also provide exclusion criteria (page 35).

workers exposure to chromium by Decharat stated that using PPE can reduce exposure of chromium to workers[12].

This study showed no significant link between age and renal function. However, as table 2 demonstrates, workers younger than 19 more often had normal renal function than older workers. However, a similar study did find a negative correlation between age and urinary creatinine[13]. As workers age, there will be alterations in physiological renal function, such as Glomerular Filtration Rate (GFR) decreasing. This alteration can make older workers more vulnerable to stimuli that may have adverse effects on their kidneys as compared to younger workers[14]. From around the age of 40, the kidneys start losing nephrons, contributing to a renal function decrease roughly 10 ml/minute/1.73 m^2 every 10 years. Thus, when reaching 40 years old, minor damage resulting in a GFR value of 60-89 ml/minute/1.73 m^2 is expected. In other words, renal function declines 10% resulting in a reduced ability of the kidneys to filter creatinine via the glomerulus[15].

We found a significant relation between electroplating workers' length of employment and renal function (table 3). The longer electroplaters work in an environment where they are exposed to chromium, the higher the exposure accumulation risk he got. Likewise, previous studies showed that as urinary Cr increases, 8-Hydroxydeoxyguanosine (8-OHdG) and malondialdehyde (MDA) increase with it[3,16,17]. These are biomarkers of oxidative stress derived damage to DNA. Within the glomerulus are mesangial cells in the epithelial tissue that function as the immune response if a toxic substance enters the kidney. These mesangial cells are equipped with IgC and C3 immune systems that specifically counter toxic substances. An extended length of employment causes frequent exposure to chromium, causing the mesangial cells to experience inflammation and provoking early damage to renal function[18].

This research also confirmed that BMI as nutritional status associated with renal function of electroplaters. Studies conducted in Southeast Asian Population stated that increased BMI is an independent risk factor for the development of declining renal function[19,20]. In addition, a study of workers in Indonesia showed obesity as one of risk factors for an impaired renal function[21]. Complex metabolic abnormalities that can affect renal diseases are one of the consequences of obesity[22,23]. An experiment on animals on a high fat diet led to obesity and explained described a glomerular hyper-filtration and hyperinsulinemia in obese samples.[24] Although the mechanism of excess body weight alone that lead to histologic and functional changes in kidneys is still elucidated[23-25].

The nephrotoxicant exposure can affect the kidneys in variety of ways, determined by the exposure dose, the exposure duration and other factors that can change the susceptibility towards renal damage. Previous studies showed adverse effect of chromium exposure toward renal cell function[17,26]. Chromium accumulated and stored in the kidneys will experience an oxidation-reduction reaction, and an electron release happens in this process. The released electron is reactive or known as Reactive Oxygen Species (ROS). The increase of ROS in the body causes the oxidate stress, thus resulting in damage to the renal glomerulus cells[18]. Nevertheless, chromium exposure can cause different reactions to the kidneys and it still remains unclear[11,27]. This study showed no relation between urinary chromium levels and renal function based on urinary creatinine. This could be due to condition under which the urine samples were taken. The urine samples were taken on spot after 4 hours working and the workers may have urinated prior

to the sampling. Chromium levels in the urine could be inadequate since after 8 hours of absorption, the kidneys can excrete as much as 60% of the Cr(VI) in the form of chromium (III)[28]. However, a study of chromium exposure in relation to renal function with different biomarkers reported that exposure to chromium did relate to renal dysfunction[7,29]. In addition, even though we found no relationship between urinary chromium and urinary creatinine, the data did show amounts of urinary chromium and creatinine exceeding the threshold value, which might increase the renal impairment.

Limitation of this study were few number of sample since there were not many of electroplating workers in informal sector and how urinary samples were collected on spot 4 hours after workers starting to work may have impact on amount of urinary chromium and urinary creatinine.

Comment [L18]: What about inclusion and exclusion factors?

CONCLUSION

There was no association between age and chromium level in the urine with renal function capacity. It may be due to on spot urinary creatinine were inadequate to indicate kidney impairment caused by Cr (VI). Working period and nutritional status had a significant association with renal function. The workers are suggested to maintain healthy lifestyle and they should wear personal protective equipment to minimize the exposure, whether a mask, rubber gloves or long sleeved clothes.

The amount of time to collect urinary samples and adding more variables that relate to chromium exposure in metal electroplating workers can be recommendation for the next research.

ACKOWLEDGEMENT

We would like to express our gratitude to all of the study participants and data collectors for their dedication during data collection. In addition, this article is attributed to Dr.Praba Ginandjar, SKM, M.Biomed, may your soul rest in peace.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

DATA AVAILABILITY

Data availability and supplementary materials would be provided if requested.

REFERENCES

Comment [L19]: References must follow the [slightly modified] Vancouver style as per MJPHM Author Guidelines.

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MALAYSIAN JOURNAL OF PUBLIC HEALTH MEDICINE (MJPHM)

EVALUATION FORM

Title & ref. no.: METAL ELECTROPLATING WORKERS' RENAL FUNCTION WHEN EXPOSED TO CHROMIUM IN RELATION TO AGE, LENGTH OF EMPLOYMENT, AND NUTRITIONAL STATUS

Kindly fill in this form as accurate as possible. Thank you for your kind cooperation.

TOPIC/SECTION	ACCEPTABLE*	COMMENTS+
Title	✓	The title is clearly what the manuscript is about.
Abstract	✓	- Short and clear summary of the aim, method, important findings and conclusions. - Enough information to stand alone
Introduction	✓	- The sentence "*It is known to be carcinogenic when enters the body particularly through the inhalation resulting not only adverse effect in the respiratory tract but also liver and kidneys organs*". It is advisable to briefly explain the phenomenon together with the reduction of Cr (VI) to its lower oxidation states.
Methodology - Population - Sampling & Sample - Data Collection - Data Analysis - Definition		- The samples collected and recruited were not clear. Thus, the results will produce potentially biased. - Specify the AAS model. - Advice to provide AAS plotting graph in the manuscript to indicated the plotting value of traced Cr in urine samples.

Results - Descriptive - Analytic / Hypothesis - Testing - Data Presentation = Tables, figures etc		- It is difficult to convey the results since the inclusion and exclusion criteria were not included in the study. - Provide a reference for the standard value of chromium level in urine. - The information is already provided in Table 1. The explanation is just to highlight the critical finding from Table 1.
Discussion - Magnitude/Consistency - Cause-effect relationship - Bias / Limitation		- Since there are no inclusion/ exclusion criteria for the samples, the study cannot identify the high value of Cr in urine due to exposure to Cr during work or other factors. The article was written by Pan et al. (2017) provided for the exclusion criteria in their study (page 2). The study conducted by Sudarsana et al. (2013) also provides exclusion criteria (page 35).
Conclusion		- Procedures were not sufficient detail, and this will affect the results and discussion. And, the conclusion also becomes unreliable.
References - Format MJPHM		References must follow the [slightly modified] Vancouver style as per MJPHM Author Guidelines.

- * *Tick √ if Yes and X if No*
- \+ *Give your expect opinion on the matter, use separate sheets if necessary*

Detail Comments (please advise the authors on how to improve their paper)

- The samples collected and recruited were not clear. Thus, the results will produce potential biased and challenging to convey reliable results. This is because the study was unable to validate the high value of Cr in urine due to exposure of Cr during work or any other factors.
- Based on previous studies, Pan et al. (2017) provided for the exclusion criteria in their study (page 2). The study conducted by Sudarsana et al. (2013) also provides exclusion criteria (page 35).
- The procedures were not sufficient detail, and this will affect the results and discussion. And, the conclusion also becomes reliable.
- Cross-checked references guidelines in MJPHM webpage.

RECOMMENDATION (tick √)

☐	= Accepted for publication (with minor corrections)
☑	= Accepted for publication (after major corrections)
☐	= To be resubmitted
☐	= To be rejected

SIGNATURE

( )

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[MJPHM] Editor Decision

Fikri Rosely <fikrirosely4@gmail.com> 20 Januari 2021 pukul 11.04
Kepada: Yuliani Setyaningsih <yulianisupomo71@gmail.com>, Ida Wahyuni <idawahyuni@live.undip.ac.id>, Ekawati <ekawati@live.undip.ac.id>, Praba Ginandjar <prabaginandjar@live.undip.ac.id>

Yuliani Setyaningsih, Ida Wahyuni, Ekawati, Praba Ginandjar:

We have reached a decision regarding your submission to Malaysian Journal of Public Health Medicine, "METAL ELECTROPLATING WORKERS' RENAL FUNCTION WHEN EXPOSED TO CHROMIUM IN RELATION TO AGE, LENGTH OF EMPLOYMENT, AND NUTRITIONAL STATUS".

Our decision is to: Accept Submission

Assist. Prof. Dr. Abed Al-abed
Editorial Assistant
Malaysia Journal of Public Health Medicine

Malaysian Journal of Public Health Medicine

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THE RENAL FUNCTION STATUS OF METAL ELECTROPLATING WORKERS EXPOSED TO CHROMIUM VI

ABSTRACT
Chromium (Cr) is commonly used as an anti-corrosive agent. Due to its unique nature, Cr is used to coat metal in order to make it looks shiny and attractive. However, hexavalent chromium (Cr (VI)), a form of chromium used in electroplating, is classified as carcinogenic substance. Its portal of entry into the human body can be through inhalation, ingestion, and dermal absorption. Talang District in central-Java, Indonesia is a center of informal sector's metal electroplating industry. Electroplating workers in the informal sector rarely wear personal protective equipment (PPE) while working. This research analyzed the relation between chromium exposure, age, length of employment, and nutritional status with renal function of metal electroplaters. The subjects of this study involved 35 electroplaters from Talang with working experience ranging between 6 and 40 years. The independent variables were age, length of employment, nutritional status and exposure to chromium. Dependent variable was workers' renal function. Urine samples were collected to determine chromium exposure and renal function based on urinary chromium and creatinine levels. Data was analyzed using chi-square test with SPSS Statistics software. The average urinary chromium and creatinine levels were 21.16 µg/L and 209.75 mg/dL respectively. This study found no relation between age and chromium levels in urine and renal function. However, length of employment and nutritional status were found to be significantly related to renal function. Although chromium exposure does not appear significantly associate with renal function, the average urinary chromium levels of metal electroplaters did exceed threshold values.
Keywords: chromium, electroplating workers, renal function

INTRODUCTION

Indonesia's informal sector consists of many workers facing numerous risk of occupational safety and health. One field with known risks is the electroplating services and metal coating process field, in which metal appliances are coated with Chromium (Cr) in order to make them stainless and give them a shiny white appearance.

The chromium used during the metal coating process can also pollute the air in the working environment in a form of mist coming from air bubble in the anode and cathode reactions happened in the coating pool. Hexavalent Chromium (Cr(VI)), a by-product form of chromium used in electroplating and metal coating is included in chemical material with various chemical characteristics and exposure in the working place.[1,2] Cr (VI) is known to be carcinogenic when enters the body particularly through the inhalation resulting not only adverse effect in the respiratory tract but also liver and kidneys organs[3-5]. In the body, Cr(VI) reduced into Cr(III) and produces excessive Reactive Oxygen Species (ROS) via Fenton pathway that can lead oxidative stress and DNA structure damage[6-8].

One of the negative effects is causing renal function disorders[9]. A research of 178 electroplating workers reported renal impairment in nearly 23 % of the subjects[9]. A study in Tegal Indonesia in 2013 found that in the informal sector, Cr level in the air and water at electroplating workplaces were above the recommended threshold value.[10] Furthermore, studies of electroplaters in informal sector showed that majority of the workers do not wear any personal protective equipment such as mask, gloves, and work outfit[10,11].

Creatinine is one of body metabolism by-products. Generally, creatinine filtered by kidneys from the blood and excreted through urine[12,13]. Creatinine levels in blood and urine can be used in the early assessment of renal function disorders[14]. High serum creatinine or urine creatinine values can be indication of renal function disorders, serum creatinine and urine creatinine checkup can be used to measure the ability of glomerular filtration rate. Besides showing that chromium exposure in the air and water which were above recommended threshold, Sudarsana also showed a connection between chromium exposures and renal dysfunction among electroplaters in Talang District, Indonesia[10]. This research proposes urine sample collection for determining Cr and creatinine level; moreover, individual characteristic of electroplaters such as age, working period and nutritional status will be also discussed.

METHOD

This research was an observational analytic quantitative study with cross sectional design[15]. The population was all electroplating home industry workers in Talang District as many as 35 electroplaters. Since this research was being done in small electroplating enterprises with few number of electroplaters, total population sampling technique which is a type of purposive sampling method was used in this research with inclusion and exclusion criteria, namely workers had more than one year working experience as electroplaters, never change occupations, did not consume dietary supplement, were not in pregnant condition when data were taken and willing to participate in this study. The workers' urinary chromium, creatinine levels, and certain characteristics were also determined. These characteristics consist of age, length of employment and Body Mass Index (BMI) as assessment of nutritional status. Digital bathroom scale and stature meter are tools for measuring weight and height of the workers in order to calculate BMI by dividing each electroplater's weight in kilograms by their height in meters squared.

Urine samples were drawn on spot 4 hours after electroplaters start working and urine samples were kept a nitric acid treated polypropylene container at -20^0 C then directly delivered to Balai besar Teknik Kesehatan Lingkungan dan Pengendalian Penyakit (BBTKLPP) laboratory Yogyakarta owned by Ministry of Health Republic of Indonesia to be analyzed. Chromium level in the urine was analyzed using Graphite Furnace Atomic Absorption Spectroscopy (AAS) GF-3000 by BBTKLPP. Graphite furnace AAS was suitable for the study focuses solely on one element and small amount of samples[16]. Urinary creatinine test was used to determine renal function of the workers. A Chi square test using SPSS Statistics Software was conducted to determine the relation between the workers' age, length of employment, nutritional status, and chromium exposure toward renal function of the workers. The ethical clearance was requested and was approved by The Health Research Ethics Committee, Public Health Faculty, Diponegoro University filed under 116/EC/FKM2018.

RESULTS

When the data were taken, almost all of the workers did not use personal protective equipments during their working hours, whether mask, gloves, rubber boots, even the long sleeved clothes. All of the workers are men and work for 8 hours a day and 40 hours a week. Table 1 shows that more than half of workers were ≥ 40 years old with average age of 39 years old (SD 6.29). There was greater number of workers who had been working for ≥ 19 years (51.4%). Most of the workers (65.7%) had normal BMI. Majority of workers (51.4%) had chromium level in urine above Biological Exposure Indices (BEI) 10 µg/L[17] with average 21.38 µg/L and the highest level of chromium in urine was 145.34 µg/L. Dominantly of workers had normal level of creatinine in urine (77.1%) with average level of creatinine in urine was 210.17 mg/dL.

Table 1. The Characteristics Distribution of Metal Electroplating Workers in Talang District

Variables	n (%)	Mean	Median	SD	min-max
Age					
≥40 years old	15(42.9)	39.69	39.00	6.29	25-56
<40 years old	20(57.1)				
Length of Employment					
≥ 19 years	18(51.4)	18.86	19.00	7.19	6-40
< 19 years	17(48.6)				
Nutritional Status(BMI)					
Severely Underweight	1 (2.9)				
Underweight	2 (5.7)				
Normal	23(65.7)	23.04	23.01	3.82	15.91-34.23
Overweight	6 (17.1)				
Obese	3 (8.6)				
Chromium level in the urine					
≥ 10 µg/L	18(51.4)	21.38	10.13	30.89	3.50-145.34
< 10 µg/L	17(48.6)				
Creatinine Level in the urine					
Abnormal	8(22.9)	210.17	207.00	105.32	28.00-479.00
Normal	27(77.1)				

Table 2 describes age in relation to renal function of metal electroplating workers. We found there was no difference in renal function capacity between workers who were at least 40 years old

and those < 40 years old (p=0.700).The amount of workers with abnormal renal function was equally divided between workers at least 40 years old and those younger than 40 years.

Table 2. Age in Relation to Renal Function of Metal Electroplating Workers in Talang District

Age	Renal Function				Total	%
	Abnormal		Normal			
	f	%	F	%		
≥40 years old	4	26.67	11	73.33	15	100
<40 years old	4	20.00	16	80.00	20	100

P = 0.700; RP = 1.333; 95 % CI = 0.396-4.487

As shown in Table 3 there was found association between working period and renal function capacity (p=0.041). There were 7 (38.89%) workers in at least 19 years working period group who had abnormal renal function compared to <19 years working period group which only had 1 (5.88%) worker who had abnormal renal function. Moreover there were more workers in <19 years working period group who had normal renal function (94.12%) compared with workers who had worked for ≥19 years (61.11%).

Table 3. Length of Employment in Relation to Renal Function of Metal Electroplating Workers in Talang District

Working Period	Renal Function				Total	%
	Abnormal		Normal			
	f	%	f	%		
≥19 years	7	38.89	11	61.11	18	100
<19 years	1	5.88	16	94.12	17	100

P = 0.041; RP = 6.611; 95 % CI = 0.906-48.252

Relation between nutritional status and renal function capacity of metal electroplating was found with p = 0.038 (Table 4). There were more overweight workers who had abnormal renal function (46.15%) compared to workers with normal (10.53%) and underweight (0%) BMI status. In contrary, all 3 workers with underweight nutritional status (100%) and majority of workers with normal BMI as many as 17 workers (89.47%) had normal renal function capacity and 7 workers (53.85%) with category of overweight had normal renal function.

Table 4. Nutritional Status (BMI) in Relation to Renal Function of Metal Electroplating Workers in Talang District

Nutritional Status (BMI)	Renal Function				Total	%
	Abnormal		Normal			
	f	%	f	%		
Underweight	0	0	3	100	3	100
Normal	2	10.53	17	89.47	19	100
Overweight	6	46.15	7	53.85	13	100

P = 0.038

Regarding chromium level in urine, it was found no relation between renal function and chromium level in urine (p=0.909). As shown in table 5 there were more workers who had chromium level < 10.13 µg/L with abnormal renal function (35.29%) compared with workers with ≥ 10.13 µg/L chromium level with abnormal renal function (27.78%). Furthermore, majority of workers with Cr level above and under 10.13 µg/L had normal renal function as many as 13 workers (72.22%) and 11 workers (64.71%) respectively.

Table 5. Urinary Chromium Level in Relation to Renal Function of Metal Electroplating Workers in Talang District

Chromium Level	Renal Function				Total	%
	Abnormal			Normal		
	f	%	f	%		
≥ 10.13 µg/L	5	27.78	13	72.22	18	100
< 10.13 µg/L	6	35.29	11	64.71	17	100

Chromium Level	Renal Function				Total	%
	Abnormal		Normal			
	f	%	f	%		
P = 0.909 ; RP = 0.787; 95% CI = 0.294-2.106						

DISCUSSION

Previous research confirmed that the industrial electroplating workers were exposed to Cr (VI)[10,18]. The average amount of urinary chromium exceeding the threshold limit value was lower than the average found in a study by Sudarsana[10]. Related to this study, workers were found working without any PPE while a study of workers exposure to chromium by Decharat stated that using PPE can reduce exposure of chromium to workers[19].

This study showed no significant link between age and renal function. However, as table 2 demonstrates, workers younger than 19 more often had normal renal function than older workers. However, a similar study did find a negative correlation between age and urinary creatinine[20]. As workers age, there will be alterations in physiological renal function, such as Glomerular Filtration Rate (GFR) decreasing. This alteration can make older workers more vulnerable to stimuli that may have adverse effects on their kidneys as compared to younger workers[21]. From around the age of 40, the kidneys start losing nephrons, contributing to a renal function decrease roughly 10 ml/minute/1.73 m^2 every 10 years. Thus, when reaching 40 years old, minor damage resulting in a GFR value of 60-89 ml/minute/1.73 m^2 is expected. In other words, renal function declines 10% resulting in a reduced ability of the kidneys to filter creatinine via the glomerulus[22].

We found a significant relation between electroplating workers' length of employment and renal function (table 3). The longer electroplaters work in an environment where they are exposed to chromium, the higher the exposure accumulation risk he got. Likewise, previous studies showed that as urinary Cr increases, 8-Hydroxydeoxyguanosine (8-OHdG) and malondialdehyde (MDA) increase with it[3,23,24]. These are biomarkers of oxidative stress derived damage to DNA. Within the glomerulus are mesangial cells in the epithelial tissue that function as the immune response if a toxic substance enters the kidney. These mesangial cells are equipped with IgC and C3 immune systems that specifically counter toxic substances. An extended length of employment causes frequent exposure to chromium, causing the mesangial cells to experience inflammation and provoking early damage to renal function[25].

This research also confirmed that BMI as nutritional status associated with renal function of electroplaters. Studies conducted in Southeast Asian Population stated that increased BMI is an independent risk factor for the development of declining renal function[26,27]. In addition, a study of workers in Indonesia showed obesity as one of risk factors for an impaired renal function[28]. Complex metabolic abnormalities that can affect renal diseases are one of the consequences of obesity[29,30]. An experiment on animals on a high fat diet led to obesity and explained described a glomerular hyper-filtration and hyperinsulinemia in obese samples.[31] Although the mechanism of excess body weight alone that lead to histologic and functional changes in kidneys is still elucidated[30-32].

The nephrotoxicant exposure can affect the kidneys in variety of ways, determined by the exposure dose, the exposure duration and other factors that can change the susceptibility towards renal damage. Previous studies showed adverse effect of chromium exposure toward renal cell function[24,33]. Chromium accumulated and stored in the kidneys will experience an oxidation-reduction reaction, and an electron release happens in this process. The released electron is reactive or known as Reactive Oxygen Species (ROS). The increase of ROS in the body causes the oxidate stress, thus resulting in damage to the renal glomerulus cells[25]. Nevertheless, chromium exposure can cause different reactions to the kidneys and it still remains unclear[18,34]. This study showed no relation between urinary chromium levels and renal function based on urinary creatinine. This could be due to condition under which the urine samples were taken. The urine samples were taken on spot after 4 hours working and the workers may have urinated prior to the sampling. Chromium levels in the urine could be inadequate since after 8 hours of absorption, the kidneys can excrete as much as 60% of the Cr(VI) in the form of chromium (III)[35]. However, a study of chromium exposure in relation to renal function with different biomarkers reported that exposure to chromium did relate to renal dysfunction[10,36]. In addition, even though we found no relationship between urinary chromium and urinary creatinine, the data did show amounts of urinary chromium and creatinine exceeding the threshold value, which might increase the renal impairment.

Limitation of this study were few number of sample since there were not many of electroplating workers in informal sector and how urinary samples were collected on spot 4 hours

after workers starting to work may have impact on amount of urinary chromium and urinary creatinine.

CONCLUSION

There was no association between age and chromium level in the urine with renal function capacity. It may be due to on spot urinary creatinine were inadequate to indicate kidney impairment caused by Cr (VI). Working period and nutritional status had a significant association with renal function. The workers are suggested to maintain healthy lifestyle and they should wear personal protective equipment to minimize the exposure, whether a mask, rubber gloves or long sleeved clothes.

The amount of time to collect urinary samples and adding more variables that relate to chromium exposure in metal electroplating workers can be recommendation for the next research.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

DATA AVAILABILITY

Data availability and supplementary materials would be provided if requested.

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[MJPHM] Editor Decision

yuliani setyaningsih <yulianisupomo71@gmail.com> 22 Januari 2021 pukul 23.58
Kepada: Fikri Rosely <fikrirosely4@gmail.com>

Dear Prof. Dr. Abed Al-abed,

Thank you very much for accepting our article.
As mentioned in MJPHM Open Journal Systems, herewith attached our article that has been formatted based on the given example.
The attachment below has been sent to MJPHM Open Journal Systems as well.
Looking forward to hearing from you soon.

Sincerely,

Corresponding Author
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Faculty of Public Health, Diponegoro University, Semarang, Indonesia
[Kutipan teks disembunyikan]

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[MJPHM] New notification from Malaysian Journal of Public Health Medicine

Fikri Rosely <fikrirosely4@gmail.com> 25 Januari 2021 pukul 21.45
Balas Ke: "Professor Dato' Dr. Syed Mohamed Aljunid" <saljunid@gmail.com>
Kepada: Yuliani Setyaningsih <yulianisupomo71@gmail.com>

You have a new notification from Malaysian Journal of Public Health Medicine:

You have been added to a discussion titled "Galley proof" regarding the submission "METAL ELECTROPLATING WORKERS' RENAL FUNCTION WHEN EXPOSED TO CHROMIUM IN RELATION TO AGE, LENGTH OF EMPLOYMENT, AND NUTRITIONAL STATUS".

Link: http://mjphm.org/index.php/mjphm/authorDashboard/submission/863

Professor Dato' Dr. Syed Mohamed Aljunid

Malaysian Journal of Public Health Medicine

Gmail **yuliani setyaningsih 7i <yulianisupomo71@gmail.com>**

Progress on Article Publication_Yuliani Setyaningsih

Abed Alabed <abed.mjphm@gmail.com> 1 April 2021 pukul 21.41
Kepada: yuliani setyaningsih <yulianisupomo71@gmail.com>
Cc: "Professor Dato' Dr. Syed Mohamed Aljunid" <saljunid@gmail.com>, editor@mjphm.org

Dear Dr. Yuliani

Thank you for your email and inquiry. There are no further requirements in this stage. We are preparing the manuscript for publication this month inshaAllah. We will update you soon.

Thank you
[Kutipan teks disembunyikan]

Gmail **yuliani setyaningsih 7i <yulianisupomo71@gmail.com>**

Progress on Article Publication_Yuliani Setyaningsih

yuliani setyaningsih <yulianisupomo71@gmail.com> 1 April 2021 pukul 11.58
Kepada: ruth.dantjie@gmail.com

Dear Professor Dato' Dr. Syed Mohamed Aljunid and Dr.Abed

Chief Editor and Support Contact

Malaysian Journal of Public Health Medicine (MJPHM)

Hello, my name is Dr.Yuliani Setyaningsih, SKM, M.Kes. from Faculty of Public Health Diponegoro University, Indonesia. My article entitled " The Renal Function Status of Metal Electroplating Workers Exposed to Chromium VI " was accepted for galley proof on January 25th 2021 in Malaysian Journal of Public Health Medicine (MJPHM). My username in MJPHM Open Journal Systems (OJS) is yulianisetyaningsih01. I have sent my galley proof and the proof of payment on January 28, 2021 through OJS and the status has remained Copyediting Discussions ever since. I would be grateful if you could let me know whether there has been any further progress on my article publication.

Thank you in advance.

Best Regards,

Dr.Yuliani Setyaningsih, SKM, M.Kes.

Faculty of Public Health

Diponegoro University, Semarang, Indonesia

Gmail yuliani setyaningsih 7i <yulianisupomo71@gmail.com>

[MJPHM] New notification from Malaysian Journal of Public Health Medicine

Fikri Rosely <fikrirosely4@gmail.com> 6 April 2021 pukul 23.48
Balas Ke: "Professor Dato' Dr. Syed Mohamed Aljunid" <saljunid@gmail.com>
Kepada: Yuliani Setyaningsih <yulianisupomo71@gmail.com>

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Professor Dato' Dr. Syed Mohamed Aljunid

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