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## The Effects of Acid-Boiling Treatment on Allergenicity of *Cerithidea obtusa* (Obtusa Horn Snail)

SITI RUKAIYAH ABD FATAH, ROSMILAH MISNAN\*, ZAILATUL HANI MOHD YADZIR, NOORMALIN ABDULLAH & FAIZAL BAKHTIAR

### ABSTRACT

The aim of this study was to determine the effects of acid-boiling treatment on allergenicity of *Cerithidea obtusa*. Snails were treated in acid (white vinegar) and then boiled. The untreated and treated snails were then extracted and fractionated by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) to determine their protein profiles. Allergenic properties were then determined by immunoblotting using sera from snail-allergic patients. SDS-PAGE of the untreated snail extract exhibited 26 protein bands with molecular masses ranging from 8 to >250 kDa. Meanwhile, fewer protein bands were seen in the acid-boiled extract. Immunoblot of untreated extract yielded 23 IgE-binding proteins ranging from 25 to 245 kDa. Five major allergens at 35, 39, 48, 61 and 100 kDa were detected in untreated *C. obtusa*. Overall, compared to the untreated extract, the acid-boiled snails induced lesser allergenic bands. The immunoblotting results clearly show lesser number of bands and decreased band frequencies for most major allergens. As a conclusion, this study indicated that acid boiled snail has lesser degree of allergenicity than the raw snail. These results would help facilitate the development of an effective diagnosis and management strategies for snail allergy in this country.

Key words: *Cerithidea obtusa*, snail, allergy, SDS-PAGE, immunoblotting

### INTRODUCTION

Obtusa horn snail (*Cerithidea obtusa*) locally known as 'siput sedut' is among the most widely consumed by society and traditionally used for therapeutic purposes (Purwaningsih, 2012). Snail is a marine gastropod mollusc in the family Potamididae (Noor Asyikin et al., 2016). Fleshy portion of sea snails utilized as food in Southeast Asia can cause allergy after its ingestion and tropomyosin has been identified as its allergen (Van et al., 1996). Snail allergy can be dangerous as most cases, report anaphylaxis resulting from inadvertent ingestion of snail in patients known to be allergic to this mollusc (Purwaningsih, 2012).

The food processing method may influence the food allergenicity (Wang, 2013). Acid ingredient especially vinegar has been used as daily food additives. Vinegar is made from raw materials containing starch or sugar through subsequent fermentation of ethanol and acetic acid and is utilized in a variety of food application (Budak et al., 2014). Acid processing by vinegar has been reported to be efficient in reducing the allergenicity of several different kinds of food. In one skin prick tests conducted amongst 18 paediatric and 26 adult patients, shrimp soaked in vinegar before cooking process produced a smaller wheal

compared to shrimp prepared conventionally (Perez-Macalalag et al., 2007).

In spite of the high prevalence of snail allergy, there is limited information regarding snail allergens because it has not been well studied (Asturias et al., 2002). Limitation of information and diagnosis of snail allergy will make a snail's allergen more complicated to manage. The effect of thermal treatment on the snails' allergenicity was revealed by other studies (Rosmilah et al., 2016a; 2016b). However, studies on the effect of other treatments on allergenicity of local edible snails have not yet been identified. Thus, the aim of this study is to identify the effects of acid-boiled treatment on allergenicity of *C. obtusa*.

### MATERIALS AND METHODS

#### Preparation of Snail Extracts

Live *C. obtusa* were purchased from a local market. 4 g of snail flesh were weighed into beakers. Vinegar was added to the samples in the ratio of 1:2 w/v, and the samples were soaked for 60 min. After treatment, the liquid was drained and the samples were rinsed with distilled water and patted dry on a clean paper towel. The beakers containing muscle samples were then covered with aluminium foil, sealed with adhesive tape, and cooked for 5 min in a boiling water bath. The allergen extracts were prepared

by homogenization of the snail (untreated and acid-boiled) in phosphate-buffered saline (PBS), pH 7.2 (1:10 weight/volume) using a blender, followed by overnight extraction at 4 °C. The homogenate was centrifuged at 14,000 rpm for 15 minutes at 4 °C. After centrifugation, the clear supernatant was filtered using a sterile 0.22 µm syringe filter. Extracts were then dried in freeze dryer. The lyophilized extracts were stored at -20 °C until use (Rosmilah et al., 2016a).

### Serum Samples

Sera from 20 patients with history of snail allergy and have specific IgE to the snail proteins in immunoblotting in previous study (Rosmilah et al., 2016a) were used in this study. Sera from non-allergic individuals were used as negative controls.

### SDS-PAGE

Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) was performed to determine the protein profile in the prepared extracts by using the method described by Rosmilah et al. (2016a). The snail proteins were treated in a denaturing Laemmli buffer and were heated at 97°C for 3 minutes. Then, protein samples (10 µg/ well) were run along with prestained molecular weight markers (BioRad, USA) in 12.5% separating gels with 5% stacking gels using a Mini Protean 3 System at 120 mA for 45 minutes (BioRad, USA). The separated proteins were visualized by staining with Coomassie brilliant blue R-250. Protein masses were estimated by comparing the snail protein bands with the molecular weight markers using an Imaging Densitometer GS800 and Quantity One Software (BioRad, USA).

### Immunoblotting

Allergenic proteins were analyzed by immunoblotting (Rosmilah et al., 2016a). The IgE-binding proteins of *C. obtusa* were performed by IgE-immunoblotting test using sera from snail-allergic patients as mentioned above. Briefly, the separated proteins of *C. obtusa* were electrophoretically transferred from unstained SDS-PAGE gel to a 0.45 µm nitrocellulose membrane using a Mini Transblot System (BioRad, USA). After this process had completed, the membrane was cut, washed with tris-buffered saline (TBS) containing 0.05 % Tween 20 (TTBS) and blocked for 1 hour in a solution of 10 % non-fat milk in TBS. The strips

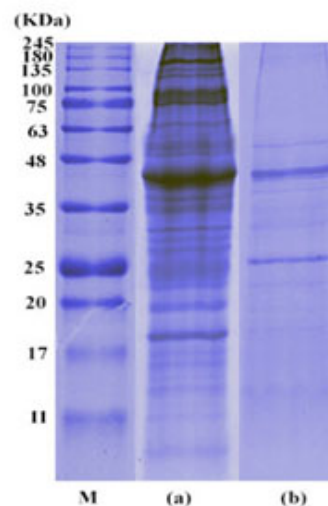
were then incubated overnight at 4 °C with the individual patient's sera (diluted 1:5 in blocking buffer). For detection of IgE-binding protein, the strips were probed in biotinylated goat-antihuman IgE (Kirkegaard and Perry Laboratories, UK), followed by incubation in streptavidin-conjugated alkaline phosphatase (BioRad, USA) and then in Alkaline Phosphatase Conjugate Substrate Kit (BioRad, USA). A strip without a serum sample was used as a blank, while serum from a non-allergic individual was used as a negative control in this experiment. The molecular weight of the protein fractions on the strips were estimated by comparing the bands with the molecular weight markers using a calibrated imaging densitometer scanning and Quantity One Software (BioRad, USA).

## RESULTS AND DISCUSSION

### SDS-PAGE

The protein components in untreated and acid-boiled extract of *C. obtusa* were separated by SDS-PAGE. Figure 1 displays the comparison of protein profiles among the untreated and the acid-boiled extracts of *C. obtusa*.

FIGURE 1. Protein profiles of chemical-treated extracts of *Cerithidea obtusa*.



(a) Untreated, (b) acid-boiled *C. obtusa*. Line M is the molecular weight marker in kiloDalton (kDa)

Fractionation of complex protein mixtures in the untreated *C. obtusa* extract resulted in at least 26 protein bands, between molecular weights of 8 to >250 kDa. Meanwhile, the acid-boiled extract produced lesser protein bands compared with the untreated extract. The

acid-boiled *C. obtusa* had only 9 protein bands. Protein bands above 46 kDa and several protein bands between 8 to 42 kDa disappeared in the acid-boiled extract of *C. obtusa* compared with SDS-PAGE of the untreated *C. obtusa* extract. Based on the SDS-PAGE gel results, the intensity of the visible protein bands in acid boiled extract was reduced than the untreated extract.

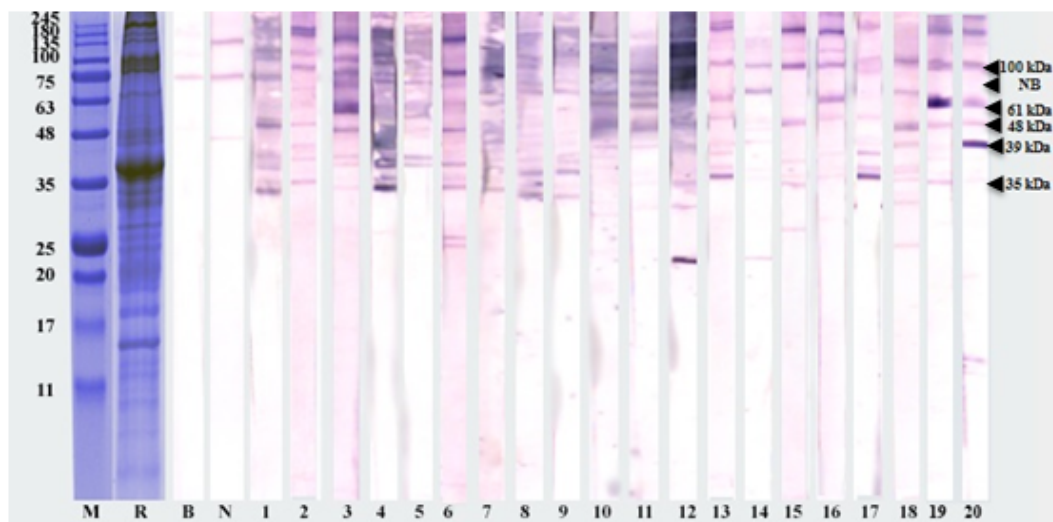
The proteins loss in the acid-boiled extract might be due to rearrangement of protein structures after treatment with acid, or aggregation of non-allergenic proteins (Kim et al., 2012). Therefore, these findings showed that treatment of *C. obtusa* with vinegar could significantly denatured the protein bands of this snail, which might also decreased the allergenicity of *C. obtusa*. This finding might provide an evidence for a decrease in the amount of snail allergens in vinegar-treated snail extracts, supporting the findings of studies that have reported that vinegar treatment reduced the allergenicity of shrimp, herring and peanuts (Kim et al., 2012; Sletten et al., 2010; Perez-Macalalag et al., 2007).

### Immunoblotting

The IgE-binding protein components of untreated and acid-boiled extracts were detected by immunoblotting. Figure 2 displays the IgE-binding proteins of untreated *C. obtusa* extract, while Figure 3 shows the IgE-binding proteins of acid-boiled *C. obtusa* extract, respectively.

This study demonstrated that all sera also demonstrated different binding profiles against snail proteins. Interestingly, immunoblotting tests indicated that, more than half of the *C. obtusa* proteins were capable of binding to IgE antibodies from snail-allergic patients. Immunoblotting of untreated *C. obtusa* extract identified numerous IgE-binding proteins at various molecular weights between 25 to 245 kDa. In this study, a protein at 48 kDa (80%) showed the highest frequency of IgE-binding proteins in untreated extracts of *C. obtusa*. In addition, proteins of 35, 39, 61 and 100 kDa have also been detected as major allergens in the untreated *C. obtusa* extract by 70, 65, 50 and 60% subjects, respectively.

FIGURE 2. Immunoblotting results of untreated *C. obtusa* using sera from 20 snail-allergic patients (lane 1 to 20).



Lane M is molecular mass markers in kiloDalton (kDa); lane R is raw; lane B is blank and lane N is immunoblot using a negative control serum. Arrows indicated the major allergens molecular weight in kDa.

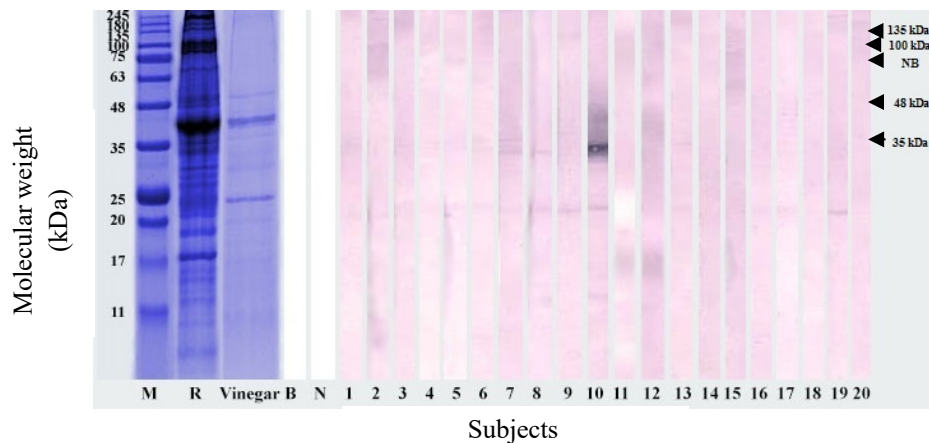
The 48 kDa were acknowledged as the most important major allergens in *C. obtusa*. Other than tropomyosin, there are other major allergens recognized in shellfish at numerous molecular weights (Khora, 2016). Arginine kinase with 40 kDa is identified as a novel shrimp allergen (Yu et al., 2003), crab

species (Nurul Izzah et al., 2015) and in some other invertebrates, such as the House-dust mite (Taylor, 2008). However, this study was unable to verify whether the 48 kDa of major allergen in local sea snail were actually arginine kinase or other proteins. Besides that, half of the tested sera demonstrated IgE-binding to the 35 and 39

kDa band. This band was consistent with the size of tropomyosin, the well-known pan-allergens in crustaceans, molluscs, insects, mites, and other invertebrates (Zailatul et al., 2015a) which

involved in the highly cross-reactivity reactions among these organisms (Lockey & Ledford, 2014).

FIGURE 3. Immunoblotting results of acid-boiled extract of *C. obtusa* using sera from 20 prawn-allergic patients (lane 1 to 20).



Lane M is molecular mass markers in kiloDalton (kDa); lane R is raw; lane B is blank and lane N is immunoblot using a negative control serum. Arrow indicated major allergen in kDa.

The wet acid-boiled *C. obtusa* extract exhibited only 14 IgE-binding bands in the range of 20 to 180 kDa with some smeared bands. This result proved that acid-boiled treatment decreases the IgE-binding activity by either lowering solubility and thus the amount of antigenic protein in the extract, or destroying its epitope. Besides that, the exposure of hidden epitopes that slightly increased the IgE-binding could explain the enhanced intensity of bands of the lengthier vinegar treated snail samples as proposed by Wang (2013). The band intensity of major allergens (35, 48, 100 and 135 kDa) of *C. obtusa* become unclear and appeared as weak smearing bands, except for the 35 kDa band, corresponding to tropomyosin, which still remain apparent after acid-boiled treatment.

### CONCLUSION

This study indicated that the acid-boiled treatment approaches can be applied to diminish snail allergenicity by decreasing the number of IgE-binding proteins. For future study, more research on identification of several allergenic proteins must be evaluated thoroughly using proteomics approach since some of the proteins have yet to be identified.

### ACKNOWLEDGEMENT

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### REFERENCES

- Asturias, J.A., Eraso, E., Arilla, M.C., Gomez-Bayon, N., Inacio, F. & Martinez, A. 2002. Cloning, isolation and IgE-binding properties of *Helix aspersa* (brown garden snail) tropomyosin. *International Archives of Allergy Immunology*, 128, 90-96.
- Budak, N. H., Aykin, E., Seydim, A. C., Greene, A. K., & Guzel-Seydim, Z. B. 2014. Functional properties of vinegar. *Journal of food science*, 79(5).
- Khora, S. S. 2016. Seafood-associated shellfish allergy: a comprehensive review. *Immunological Investigations*, 45(6), 504-530.
- Kim, J., Lee, J., Seo, W. H., Han, Y., Ahn, K., & Lee, S. I. 2012. Changes in major peanut allergens under different pH conditions. *Allergy, asthma & immunology research*, 4(3), 157-160.
- Lockey, R. F., & Ledford, D. K. 2014. *Allergens and Allergen Immunotherapy: Subcutaneous, Sublingual, and Oral*. CRC Press.

- Noor Asyikin, K., Rosmilah, M., & Zailatul, H.M.Y. 2016. Identification of major allergenic spots of *Cerithidea Obtusa* (obtusa horn shell) by two-dimensional electrophoresis (2-DE) and Immunoblotting. *International Journal of Science, Environment and Technology*, Vol. 5, No 1, 2016, 222 – 228
- Nurul Izzah, A.R., Rosmilah, M., Zailatul Hani, M.Y., Noormalin, A., Faizal, B., & Shahnaz, M. 2015. Identification of major and minor allergens of mud crab (*Scylla Serrata*). *Medicine and Health*, 10(2), 90-97
- Perez-Macalalag, E., Sumpaico, M., & Agbayani, B. 2007. Shrimp allergy: effect of vinegar soaking on allergenicity. *The World Allergy Organization Journal*, S317.
- Purwaningsih, S. 2012. Aktivitas antioksidan dan komposisi kimia Keong Matah Merah (*Cerithidea obtusa*) (Antioxidant activity and nutrient composition of atah Merah Snail (*Cerithidea obtusa*). *ILMU KELAUTAN: Indonesian Journal of Marine Sciences*, 17(1), 39-48.
- Rosmilah, M., Norazlin, S.A.A., Zailatul, H. M. Y., Faizal, B., Noormalin, A., & Shahnaz, M. 2016a. Impacts of thermal treatments on major and minor allergens of sea snail, *Cerithidea obtusa* (Obtuse Horn Shell). *Iranian Journal of Allergy, Asthma and Immunology*, 15(4), 309-316.
- Rosmilah, M., Norazlin, S.A.A., Zailatul, H.M.Y., Noormalin, A., Faizal, B., & Shahnaz, M. 2016b. Comparison of allergenic proteins of sea snail (*Cerithidea Obtusa*) and freshwater snail (*Pomacea Canaliculata*). *Jurnal Teknologi*, 78(11), 113-119.
- Sletten, G., Van Do, T., Lindvik, H., Egaas, E., & Florvaag, E. 2010. Effects of industrial processing on the immunogenicity of commonly ingested fish species. *International Archives of Allergy and Immunology*, 151(3), 223-236.
- Taylor, S.L. 2008. Molluscan shellfish allergy. *Advances in Food Nutrition Research*, 54, 140-177.
- Van, R.R., Antonicelli, L., Akkerdaas, J.H., Pajno, G.B., Barberio, G., Corbetta, L., Ferro, G., Zambito, M., Garritani, M.S., Aalberse, R.C. & Bonifazi, F. 1996. Asthma after consumption of snails in house-dust-mite-allergic patients: a case of IgE cross-reactivity. *Allergy*, 51, 387-393.
- Wang, Y. 2013. Effects of vinegar treatment on detectability and allergenicity of finfish (Doctoral dissertation, The Florida State University).
- Yu, C. J., Lin, Y. F., Chiang, B. L., & Chow, L. P. 2003. Proteomics and immunological analysis of a novel shrimp allergen, Pen m 2. *The Journal of Immunology*, 170(1), 445-453.
- Zailatul, H. M. Y., Rosmilah, M., Faizal, B., Noormalin, A., & Shahnaz, M. 2015. Malaysian cockle (*Anadara granosa*) allergy: Identification of IgE-binding proteins and effects of different cooking methods. *Tropical Biomedicine*, 32(2), 323-334.

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## **Pemencilan *Acanthamoeba* sp. daripada Swab Kulit individu Normal** (Isolation of *Acanthamoeba* sp. from Skin Swabs of Normal Individual)

MOHAMED KAMEL ABD. GHANI\*, ANDRY DAUNI, ANISAH NORDIN, YUSOF SUBOH, NORAINA ABDUL RAHIM & NORAZAH AHMAD

### **ABSTRAK**

Ameba hidup bebas dari genus *Acanthamoeba* sp. adalah organisma yang tersebar luas di persekitaran semulajadi dan boleh menyebabkan jangkitan pada otak, mata dan kulit manusia. Kajian ini dijalankan untuk memencilkan *Acanthamoeba* sp. daripada kulit, individu normal. Seramai 71 orang telah mengambil bahagian sebagai subjek kajian yang terdiri daripada kanak-kanak Tadika Bijak, pelajar sekolah rendah dan sekolah menengah Tanjung Karang, pelajar UKM Kampus Kuala Lumpur, kakitangan pembersihan KTSN, pekerja kuari dan kakitangan yang berkhidmat dengan kerajaan. Pengambilan swab kulit dilakukan pada setiap subjek. Kesemua sampel dikulturkan mengikut tatacara piawai dan diinokulasikan ke atas plat agar bukan nutrien yang telah dititiskan dengan *Escherichia coli* matian haba. Plat agar kemudian dieram pada suhu 30°C dan diperiksa setiap hari selama 14 hari di bawah mikroskop kebalikan untuk mengesan sebarang kehadiran trofozoit atau sista *Acanthamoeba* sp. Hasil kajian ini mendapati *Acanthamoeba* sp. berjaya dipencilkan daripada kulit individu normal dengan peratusan sebanyak 8.5%. Hasil positif diperolehi daripada pelajar UKM Kampus Kuala Lumpur dan kakitangan pembersihan KTSN. Keputusan ini membuktikan kehadiran *Acanthamoeba* sp. pada kulit individu normal. Kumpulan *Acanthamoeba* yang dipencil terdiri daripada kumpulan polyphagids dan culbertsonids. Golongan yang berisiko tinggi untuk memberikan hasil positif juga dikenalpasti iaitu mereka yang mempunyai sejarah terdedah kepada persekitaran berdebu dan bersentuhan dengan tanah.

Kata kunci : Pemencilan; *Acanthamoeba*; Swab kulit; Malaysia

### **ABSTRACT**

Free living amoeba from the genus *Acanthamoeba* sp. is widely distributed in the natural environment and can cause infection of the human brain, eye and skin. This study was carried out to isolate *Acanthamoeba* sp. from the skin of normal individual. A total of 71 persons had been recruited as subjects comprising children from Tadika Bijak, students from primary and secondary school around Tanjung Karang, students of the UKM Kuala Lumpur Campus, KTSN's cleaners, quarry workers and government staffs. Skin swabs were collected from all subjects. All samples were cultured using standard method and inoculated on non-nutrient agar plates overlaid with *Escherichia coli*. The plates were incubated at 30°C and examined daily using inverted microscope for 14 days for the presence of trophozoites or cysts of *Acanthamoeba* sp. The result of this study established that *Acanthamoeba* spp. were successfully isolated from the skin of normal individual at a percentage of 8.5%. Positive results came from students of UKM Kuala Lumpur Campus and KTSN's cleaners. These results proved the presence of *Acanthamoeba* sp. from the skin of normal individual. The *Acanthamoeba* isolated belongs to the polyphagids and culbertsonids groups. The group of individuals at risk of harbouring *Acanthamoeba* had also been identified as those who had a history of exposure to dusty environment and contact with soil.

Key words: Isolation; *Acanthamoeba*; Skin swab; Malaysia.

### **PENGENALAN**

*Acanthamoeba* adalah ameba hidup bebas yang tersebar luas dalam persekitaran semula jadi (Martinez & Visvesvara 1997). Ia tersebar luas di seluruh dunia dan pernah dipencilkan daripada tanah, debu, udara, air semula jadi dan yang dirawat, air laut, kolam renang, air kumbahan, sedimen, unit pendingin udara, air paip domestik, unit rawatan gigi, unit dialisis dan hospital, bekas pencuci mata dan peralatan kanta sentuh. *Acanthamoeba* adalah agen penyebab kepada

meningoensefalitis ameba bergranuloma (GAE), sejenis penyakit pada sistem saraf pusat (SSP) yang boleh membawa kematian dan keratitis ameba (AK), sejenis penyakit mata yang boleh mengancam penglihatan seseorang (Jones et al. 1975). Kajian mendapati *Acanthamoeba* sp. juga berkait rapat dengan lesi kutaneus dan sinusitis pada pesakit AIDS dan individu lain yang terimunokompromi (Dunand et al. 1997; Friedland et al. 1992; Gullet et al. 1979).

Di Malaysia, pemencilan *Acanthamoeba* sp. daripada peralatan kanta sentuh, tanah, udara,

persekitaran akuatik, air laut dan air paip telah berjaya dilakukan oleh penyelidik tempatan (Mohamed Kamel et al. 2013; Mohamad Kamel et al. 2018a, 2018b, 2018c; 2017). Kajian-kajian sebelum ini yang dilakukan oleh samada penyelidik tempatan atau luar negara telah membuktikan bahawa *Acanthamoeba* sp. boleh dipencilkan daripada pelbagai persekitaran termasuk pada manusia. *Acanthamoeba* pernah dipencilkan daripada udara dan daripada epitelium nasal individu normal (Schuster & Visvesvara 2004; Mohamed Kamel et al. 2018b) khususnya pada musim berangin. Sista *Acanthamoeba* mudah tersebar melalui udara dan boleh sampai ke permukaan epitelium nasal (Lemgruber et al. 2010). Daripada kaviti nasal, ia boleh sampai ke sistem saraf pusat melalui saluran respiratori dan peredaran darah (Khan 2007, Siddiqui & Khan 2012).

Kes pertama keratitis *Acanthamoeba* sp. di Malaysia yang melibatkan seorang wanita pada tahun 1995 menunjukkan bahawa negara ini tidak terlepas daripada ancaman parasit ini (Mohamed Kamel & Norazah 1995). Bermula dengan kes tersebut, maka pelbagai kajian untuk mempelajari sebaran ameba ini di persekitaran negara telah dijalankan. Namun demikian, pemencilan ameba hidup bebas ini daripada kulit individu normal masih jarang dilakukan. Oleh itu, kajian ini dijalankan untuk mengkaji kekerapan atau peratus kehadiran *Acanthamoeba* sp. pada kulit individu normal sekaligus membuktikan sejauh mana pendedahan manusia ke atas organisma ini.

## BAHAN DAN KAEDAH

Swab kulit diambil daripada setiap peserta yang merupakan individu normal yang menjadi subjek kajian. Subjek dipilih secara rawak daripada kumpulan umur dan tempat yang berlainan di sekitar Selangor dan Wilayah Persekutuan. Jumlah keseluruhan subjek yang dipilih adalah seramai 71 orang. Untuk kumpulan subjek yang pertama seramai 10 orang telah diambil daripada kanak-kanak Tadika Bijak, Jalan Semarak, iaitu mereka yang berumur di antara 4 hingga 7 tahun. Kumpulan subjek seterusnya diambil daripada pelajar sekolah rendah dan sekolah menengah Tanjung Karang yang berumur di antara 7 hingga 19 tahun. Jumlah subjek kumpulan ini adalah seramai 14 orang. Sementara untuk kumpulan pelajar Universiti Kebangsaan Malaysia (UKM), seramai 24 orang subjek telah dipilih dari lingkungan umur 19 hingga 29 tahun. Pelajar

UKM yang diambil termasuk pelajar yang tinggal di Kolej Tun Syed Nasir (KTSN) 1 dan 2 serta mereka yang tinggal di luar kolej. Seramai 10 orang subjek yang berumur daripada 22 hingga 33 tahun diambil daripada kakitangan pembersihan KTSN. Selain itu, kumpulan subjek seramai 8 orang yang berumur daripada 19 hingga 44 tahun diambil daripada pekerja Kuari Daerah Kepong. Kumpulan subjek terakhir iaitu seramai 5 orang diambil daripada mereka yang berkhidmat dengan kerajaan iaitu dalam lingkungan 24 hingga 60 tahun. Pengambilan subjek adalah seimbang dari aspek jantina.

Sampel diambil dengan melakukan swab kulit pada tangan dengan menggunakan swab yang steril. Sampel yang diperolehi dimasukkan ke dalam botol universal yang mengandungi 10 ml larutan salin Page sebagai media pengangkut. Sampel swab yang telah dimasukkan ke dalam botol universal yang mengandungi larutan salin Page akan di vorteks selama tiga minit untuk memastikan kesemua organisma termasuk *Acanthamoeba* sp. tertanggal daripada swab dan permukaan dinding botol universal. Sampel yang telah di vorteks kemudian dituras melalui membran turas bersaiz liang 0.45  $\mu\text{m}$  menggunakan pam vakum.

Setelah proses penurasan selesai, membran turas yang mengandungi sedimen sampel akan dipindahkan secara terbalik ke atas permukaan agar bukan nutrien yang telah dititiskan dengan suspensi *E. coli* matian haba. Seterusnya, plat dieram pada suhu 30°C dan selepas 3 hari pengeraman, sampel diperiksa untuk kehadiran trofozoit atau sista *Acanthamoeba* di bawah mikroskop kebalikan selama 14 hari sebelum disahkan negatif.

Bagi pengecaman kumpulan *Acanthamoeba*, kriteria Page (1967) digunakan semasa mengamati peringkat sista dengan menggunakan program Image Analysis Software Video-Test 4.0. Saiz dan morfologi dinding sista iaitu endosista dan ektosistanya dapat memberi gambaran mengenai kumpulan *Acanthamoeba* samada kumpulan I (astronyxids), kumpulan II (polyphagids) atau kumpulan III (culbertsonids).

## HASIL KAJIAN

Pemencilan daripada swab kulit, menunjukkan 6 daripada 71 (8.5%) sampel adalah positif dengan kehadiran *Acanthamoeba* sp. (Jadual 1). Tiga orang subjek yang positif terhadap *Acanthamoeba* adalah pelajar UKM Kampus Kuala Lumpur manakala 3 lagi adalah

kakitangan pembersihan KTSN (Jadual 2). Pengenalpastian *Acanthamoeba* sp. daripada sampel swab yang positif mengikut kumpulan

ditunjukkan di dalam Jadual 3 dan dua kumpulan yang dikenalpasti ialah kumpulan polyphagids dan culbertsonids.

JADUAL 1. Peratus keseluruhan sampel swab kulit yang positif *Acanthamoeba* sp.

Jenis sampel	Bilangan sampel yang positif / jumlah keseluruhan sampel	Peratus sampel yang positif <i>Acanthamoeba</i> sp. (%)
Swab Kulit	6 / 71	8.5

JADUAL 2. Pemencilan *Acanthamoeba* sp. mengikut kumpulan subjek.

Kumpulan subjek	Bilangan sampel positif <i>Acanthamoeba</i> sp. / jumlah keseluruhan Sampel yang diuji	(%)
1. Kanak-kanak Tadika Bijak	0 / 10	0
2. Sekolah rendah dan sekolah menengah Tanjung Karang	0 / 14	0
3. Pelajar UKM kampus Kuala Lumpur	3 / 24	12.5
4. Kakitangan pembersihan KTSN	3 / 10	30
5. Pekerja Kuari	0 / 8	0
6. Kakitangan kerajaan	0 / 5	0

JADUAL 3. Pengenalpastian jenis kumpulan *Acanthamoeba* sp. yang dipencil.

Jenis sampel	No. Subjek	Kumpulan
Pelajar UKM kampus Kuala Lumpur	26	<i>culbertsonids</i>
	27	<i>polyphagids</i> dan <i>culbertsonids</i>
	32	<i>polyphagids</i>
Kakitangan pembersihan KTSN	36	<i>culbertsonids</i>
	39	<i>polyphagids</i> dan <i>culbertsonids</i>
	40	<i>culbertsonids</i>

## PERBINCANGAN

Seperti mikroorganisma yang lain, *Acanthamoeba* sp. tersebar luas di persekitaran, di seluruh dunia. Sumber atau habitat semulajadi

yang biasa didiami oleh ameba hidup bebas ini adalah tanah dan kawasan perairan. Menurut kajian-kajian yang lepas, penyebarannya dipengaruhi oleh beberapa faktor. Warhurst (1985) dan Mazur et al. (1995) mendapati sifat

keresistanan yang ada pada sista *Acanthamoeba* sp. adalah faktor utama dalam kebolehbearannya secara meluas dan mampu hidup sehingga mencapai satu jangka masa yang panjang tanpa kehadiran sebarang makanan. Dengan pemencilan daripada pelbagai jenis persekitaran, tempat-tempat atau sumber-sumber yang berisiko untuk mendatangkan infeksi *Acanthamoeba* sp. telah dapat ditentukan. Pada manusia sendiri, *Acanthamoeba* sp. pernah diisolasi daripada nasal (Lawande et al. 1979; Mohamed Kamel et al. 2018), kulit (Marshall 1997), tekak (Wang & Feldman 1967) dan tulang (Borochovitz et al. 1981).

Di Malaysia yang turut tidak terlepas daripada ancaman ameba hidup bebas ini, penyelidikan telah dimulakan khususnya kajian dari segi pemencilan. Antara pemencilan *Acanthamoeba* sp. yang pernah dilakukan terhadap manusia termasuklah pemencilan daripada kornea bagi pesakit keratitis (Mohamed Kamel & Norazah 1995); swab mata individu normal (Anisah et al. 2005; Mohamed Kamel et al. 2013) dan swab nasal individu normal (Mohamed Kamel et al. 2018). Dalam kajian ini, *Acanthamoeba* spp. telah berjaya dipencilkan daripada 8.5% (6/71) sampel swab kulit individu normal. Sekaligus ini membuktikan kajian yang dilakukan oleh para penyelidik luar negara sebelum ini. Daripada kumpulan subjek yang dipilih secara rawak, pelajar UKM Kampus Kuala Lumpur dan pekerja pembersihan KTSN menunjukkan hasil keputusan yang positif.

Keenam-enam subjek yang menunjukkan hasil positif bagi swab kulit mempunyai sejarah atau faktor risiko terdedah kepada persekitaran luar yang berdebu dan terlibat dalam aktiviti yang bersentuhan dengan tanah. *Acanthamoeba* sp. ini kemungkinan diperolehi melalui salah satu atau kedua-dua sumber faktor risiko tersebut.

Kajian pemencilan ini hanya mengenalpasti *Acanthamoeba* sp. di peringkat kumpulan sahaja. Dua kumpulan iaitu kumpulan II (polyphagids) dan kumpulan III (culbertsonids) berjaya dipencilkan berdasarkan pemerhatian morfologi endosista dan ektoista. Kedua-dua kumpulan ini merupakan kumpulan *Acanthamoeba* yang utama di persekitaran, khasnya kumpulan polyphagids. Kumpulan polyphagids juga terkenal sebagai kumpulan yang mempunyai patogenisiti yang tinggi. Kolonisasi *Acanthamoeba* pada kulit berkait

rapat dengan kebolehbearannya menyebabkan jangkitan kutaneus.

Walaupun peratus pemencilan *Acanthamoeba* pada kulit individu normal agak rendah dalam kajian ini, ia telah membuktikan *Acanthamoeba* sp. boleh dipencilkan daripada tubuh manusia walaupun bukan sebagai flora normal.

## RUJUKAN

- Anisah N, Amal H, Kamel AG, Yusof S, Noraina AR, Norhayati M. 2005. Isolation of *Acanthamoeba* sp. from conjunctival sac of healthy individuals using swab. *Tropical Biomedicine* 22:1;11-14.
- Borochovitz, D., Martinez, A.J. & Patterson, G.T. 1981. Osteomyelitis of a bone graft of the mandible with *Acanthamoeba castellanii* infection. *Human Pathology* 12: 573-576.
- Dunand, V.A., Hammer, S.M., Rossi, R., Poulin, M., Albrecht, M.A., Doweiko, J.P., DeGirolami, P.C., Coakley, E., Piessens, E. & Wanke, C.A. 1997. Parasitic sinusitis and otitis in patients infected with human immunodeficiency virus: report of five cases and review. *Clinical Infectious Diseases* 25: 267-272.
- Friedland, L.R., Raphael, S.A., Deutsch, E.S., Johal, J., Martyn, L.J., Visvesvara, G.S. & Lischner, H.W. 1992. Disseminated *Acanthamoeba* infection in a child with symptomatic human immunodeficiency virus infection. *Journal of Pediatric Infectious Diseases* 11:404-407.
- Gullett, J., Mills, J., Hadley, K., Podemski, B., Pitts, L. & Gelber, R. 1979. Disseminated granulomatous *Acanthamoeba* infection presenting as an unusual skin lesion. *American Journal of Medicine* 67: 891-896.
- Jones, B.R., Visvesvara, G.S. & Robinson, N.M. 1975. *Acanthamoeba polyphaga* keratitis and *Acanthamoeba* uveitis associated with fatal meningoencephalitis. *Trans. Ophthalmology Society U.K.* 95: 221-232.
- Khan NA. 2007. *Acanthamoeba* invasion of the central nervous system. *Int J Parasitol* 37: 131-138.
- Lawande, R.V., Abraham, S.N., John I. & Egler L.J. 1979. Recovery of soil amoebas from the nasal passages of children during the dusty hartmattan period in Zaria. *American Journal of Clinical Pathology* 71:201-203.
- Lemgruber L, Lupetti P, De Souza W, Vommaro RC, da RochaAzevedo B. 2010. The fine structure of *Acanthamoeba polyphaga* cyst wall. *FEMS Microbiol Lett* 305: 170-176.
- Marshall, M.M., Naumovitz, D., Ortega, Y. & Sterling, C.R. 1997. Waterborne protozoan

- pathogens. *Clinical Microbiology Reviews* 10(1): 67-85.
- Martinez, A.J & Visvesvera, G.S. 1997. Free-living, amphizoic and opportunistic amebas. *Brain Pathology* 7: 583-589.
- Mazur, T., Hades, E. & Iwanicka, I. 1995. The duration of cyst stage and the viability and virulence of *Acanthamoeba* isolates. *Tropical Medicine Parasitology* 46: 106-108.
- Mohamed Kamel, A.G. & Norazah, A. 1995. First case of *Acanthamoeba* keratitis in Malaysia. *Transactions of the, Royal Society of Tropical Medicine and Hygiene* 89: 652.
- Mohamed Kamel Abd. Ghani, Andry Dauni, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2018. Isolation of *Acanthamoeba* sp. from nasal swabs of normal individual. *Buletin FSK* 2(1): 89-94.
- Mohamed Kamel Abd Ghani, Mimi Fazah, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. Isolation of *Acanthamoeba* spp. from soil environment. 2018a. *Buletin FSK* 2(1): 89-94.
- Mohamed Kamel Abd. Ghani, Mohd Hasrul Hassan, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2018b. Isolation of *Acanthamoeba* sp. from the air. *Buletin FSK* 2(2):8-11.
- Mohamed Kamel Abd Ghani, Nurulhuda, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2018c. Isolation of *Acanthamoeba* sp. from aquatic environment. *Buletin FSK* 2(1):89-94.
- Mohamed Kamel Abd Ghani, Nurulhuda Sharif, Anisah Nordin, Yusof Suboh, Noraina Abd Rahim & Norazah Ahmad. 2017. Isolation of *Acanthamoeba* spp. from domestic water taps. *Buletin FSK* 1(1):89-94.
- Mohamed Kamel Abd Ghani, Saleha Abdul Majid, Noradillah Samseh Abdullah, Anisah Nordin, Yusof Suboh, Noraina Abd Rahim, Haliza Abdul Mutalib and Norazah Ahmad. 2013. Isolation of *Acanthamoeba* spp. from contact lens paraphernalia. *International Med Journal* 20:1;66-68.
- Page, F.C. 1967. Re-definition of the genus *Acanthamoeba* with descriptions of three species. *Journal of Protozoology* 14:709-724.
- Schuster FL, Visvesvara GS. 2004. Free-living amoebae as opportunistic and non-opportunistic pathogens of humans and animals. *Int J Parasitol* 34: 1001-1027.
- Siddiqui R, Khan NA. 2012. Biology and pathogenesis of *Acanthamoeba*. *Parasit Vectors* 5: 6. doi: 10.1186/1756-3305-5-6.
- Wang, S.S. & Feldman, H.A. 1967. Isolation of *Hartmanella* species from human throats. *The New England Journal of Medicine* 277(22):1174-9.
- Warhurst, D.C. 1985. Pathogenic free living amoebae. *Parasitology Today* 1: 24-27.

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## **Time Difference between Dominant and Non-Dominant Leg Turning During Timed Up and Go Test**

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### **ABSTRACT**

Falls are global health issue among older adults. Most of our everyday tasks involve turning and it is one of the common causes of falls. The aim of this study was to examine the time difference between dominant and non-dominant leg turning during Timed Up and Go Test (TUG) standard and TUG cognitive among healthy older adults. A cross-sectional study was conducted among 50 community-dwelling older adults (age: 70.0±6.0). The participants were assessed using TUG standard and TUG cognitive by turning towards dominant and non-dominant leg. A two-way ANOVA with repeated measures was used to examine the effects of dominant and non-dominant leg turning during TUG standard and TUG cognitive. The results of the study showed a significant main effect for time difference between TUG standard and TUG cognitive [ $F(1,49)= 62.495, p<0.001$ ]. TUG cognitive is a dual task test and it places additional loads on the brain's executive function which interferes with motor control tasks such as walking. However, there was no significant ( $p = 0.79$ ) time difference between dominant and non-dominant leg turning during TUG standard and TUG cognitive. This study suggest that older adults can turn to their preferred side during TUG test.

Keywords: older adults; turning; dominant leg; non-dominant leg; falls; TUG

### **INTRODUCTION**

Approximately 30% older people aged 60 and above experience a fall in a year (Rubenstein 2006). Depending on the settings, prevalence of falls among Malaysian older adults ranged between 4 to 60% (Shaharudin, Singh & Shahar 2018). It was also noted that the risk of falls increases by three-folds for those with history of falls (Allan et al. 2009; Suttanon et al. 2013). Unprecedented falls could restrict activities in daily living and increase fear of falling among older adults (Terroso et al. 2014).

Fall-related injuries were estimated to occur eight times more common during turning than straight-line walking (Cumming & Klineberg 1994). Turning or changing direction while walking involves multiple changes in the body mechanics, complex motor planning and execution (Dite & Temple 2002). Thus, ability to turn while walking is important to regain independence, given that performance measures such as longer time taken to turn, increased number of steps taken to turn, lack of pivoting or staggering when turning were all identified as indicators of turning difficulty (Thigpen et al. 2000; Tinetti 1986).

The Timed Up and Go Test (TUG) is a single-task test, known to be useful in predicting falls among older adults with frailty. Although TUG was found to be the best simple test to

screen for fallers and non-fallers among healthy older adults (Samah et al. 2018), this test on its own may be inadequate in predicting falls (Ibrahim et al. 2017). Even among healthy older adults, TUG test is dependent on the age, gender and cognitive status of each individual (Ibrahim, Singh, Shahar 2017).

Unlike TUG standard, TUG cognitive is a method of assessing executive function while walking (Gothe et al. 2014; Toulotte et al. 2006). It has been reported that a decline in executive function was significantly associated with altered gait (Springer et al. 2006; Shumway-Cook et al. 2000) and physical performance (Won et al. 2014) in older adults. Postural stability decreases during concurrent performance of physical and cognitive tasks in older adults (Shumway-Cook et al. 1997). The inability to perform two or more tasks simultaneously (multi or dual tasking) is an indicator for a higher fall risk (Mesbah et al. 2017; Shumway-Cook et al. 2000). These observations could be explained by research results showing that cognitive capacity for processing information is limited (Hall et al. 2011).

TUG standard and TUG cognitive tests involve four important motor execution i.e. body shifting, transferring, walking and turning. Whilst many studies focused on the time taken to complete these TUG tasks, there remain a lack of knowledge on the time difference between each

direction of turning during TUG tests (DeMoraes-Faria et al. 2016; Chow 1997; Heung & Ng 2009). In only three studies the time difference between each direction of turning was reported, in which two of these studies were among participants with stroke (DeMoraes-Faria et al. 2016; Heung & Ng 2009) and one study among participants with hip and lower limb fractures (Chow 1997). However, results of these three studies were inconsistent and showed discrepancy. Turning direction had no significant effect on the time to complete the TUG test in strokes participants in a study by DeMoraes-Faria et al. 2016. Whereas, in the study by Chow et al. (1997) and Heung & Ng (2009), shorter time to complete TUG test was reported when turning on unaffected side in participants with hip and lower limb fractures and affected side in participants with stroke, respectively. To the best of our knowledge, the time difference between turning towards dominant or non-dominant leg among older adults without lower limb impairments has not been examined.

There is limited information available on the difference between turning towards dominant or non-dominant leg during Timed Up and Go test (TUG) in healthy older adults. The aim of our present study was to examine the time difference between turning towards dominant or non-dominant leg during TUG standard and TUG cognitive among older adults. We hypothesized that turning towards dominant leg takes shorter time compared to the non-dominant leg during performance of both TUG standard and TUG cognitive among healthy older adults.

## METHODOLOGY

In this cross-sectional study, 50 community-dwelling older adults who fulfilled the inclusion criteria (including aged 60 years and above, ability to understand simple verbal instruction for TUG and ability to independently walk for at least 5 meters with or without walking devices) were recruited using convenient sampling. Participants were recruited at senior citizen clubs located at two urban cities in Selangor, Malaysia. The participants were excluded if they presented with musculoskeletal, cardiac and neurological impairments that could prevent their participation in TUG tests or were on medication that causes drowsiness, nausea and sleepiness. Informed consent was obtained from each participant. Ethical approval was obtained from the secretariat of research and ethics, Universiti

Kebangsaan Malaysia (UKM PPI/111/8/JEP-2018-061) prior to the study.

## INSTRUMENT TIMED UP & GO TEST (TUG)

TUG standard test is a measure of functional mobility among older adults. It was reported to have high reliability score (ICC = 0.98) in older adults (Singh et al. 2015). TUG standard test was initially developed by Mathias et al. (1986) to measure the stand up and sit ability among older adults and was modified by Podsiadlo and Richardson (1991). It was demonstrated to exhibit high reliability and validity (0.99). TUG cognitive is a test to measure dual task: walking while counting backwards and was demonstrated to have good to excellent reliability [(ICC<sub>2,1</sub>) = 0.70–0.93] (Yang et al. 2016).

## PROCEDURE

TUG-standard and TUG-cognitive were conducted under similar conditions in a comfortable environment. TUG-standard was tested using a standardized procedure, where each participant was asked to rise from the chair (46 cm high), walk forward in normal speed for 3 meters, make a 180° turn, walk back to the chair and sit down (Whitney et al. 2005). Participants were allowed to use their walking aids but no assistance was provided. The time taken for two TUG sessions was recorded and presented in seconds (Bohannon 2006). Participants were allowed to familiarize with the procedure via an experimental session, and two trial sessions were performed with adequate rest in between tests. The mean scores of the two tests were taken as the test score.

TUG cognitive was conducted using same procedure but with an additional task that included counting backwards by subtraction of 2 numbers from a randomly selected number between 20 and 100 while performing the test. During both TUG standard and cognitive tests, in which the turning was performed towards both sides, participants were first instructed to perform TUG with turning towards their preferred side (considered as dominant leg turning). After a rest (about 1 to 5 minutes) participants were instructed to perform a second trial turning towards the opposite side (considered as non-dominant leg turning). All participants performed TUG standard and

cognitive turns towards both directions, and the results were included for analyses. During the tests, the examiner stood by the participants for safety in case there was a risk of fall (DeMoraes-Faria et al. 2016).

## STATISTICAL ANALYSIS

Data obtained from this study was analyzed using Statistical Package of Social Sciences (SPSS, Version 23 from Armonk, NY: IBM Corp). Descriptive statistics was used for demographic data and two-way ANOVA with

repeated measures was used for comparison of mean difference between dominant and non-dominant leg turning for normally distributed TUG standard and TUG cognitive data. Analysis was considered statistically significant at  $p < 0.05$ .

## RESULTS

Table 1 shows the demographic data for 50 participants involved in this study, whereby 78% were females ( $n = 39$ ). Mean age of the participants was 70 (SD = 6) years.

TABLE 1. Demographic data among older adults at Kampung Tunku Mosque and Suvarnamitra house ( $n = 50$ )

Demographic	Mean (SD)	n (%)	Range
Age years	70 (6)		60 - 83
Gender			
Male		11 (22)	
Female		39 (78)	

Table 2 shows the descriptive statistics for TUG-standard and TUG-cognitive tests with both dominant and non-dominant leg turnings. Examination of the means indicated that time taken to complete TUG-cognitive (dominant leg: Mean = 10.81; SD = 3.02, non-dominant leg: Mean = 10.61; SD = 3.27) was longer than TUG-standard (dominant leg: Mean = 8.71; SD = 2.03, non-dominant leg: Mean = 8.58; SD = 1.85), regardless of the turning direction.

Table 3 reports the comparison of time difference between dominant and non-dominant leg turning during TUG standard and TUG cognitive. Although a significant main effect was obtained for time difference between TUG standard and TUG cognitive [ $F(1,49) = 62.495$ ,

$p < 0.001$ ], no significant main effect was detected for time difference between dominant and non-dominant leg turning [ $F(1,49) = 0.069$ ,  $p > 0.79$ ]. There was also no significant main effect for the time difference between dominant and non-dominant leg turning during TUG standard and TUG cognitive tests [ $F(1,49) = 1.529$ ,  $p > 0.22$ ].

## DISCUSSION

Results from our study rejected the hypothesis that turning using dominant leg takes shorter time compared to the non-dominant leg during TUG

TABLE 2. Descriptive statistics of time taken during TUG-standard and TUG-cognitive by using dominant leg and non-dominant leg ( $n = 50$ )

Variables	Mean (SD)	Range
TUG-standard (dominant leg), s	8.71 (2.03)	5.00 – 14.50
TUG-standard (non-dominant leg), s	8.58 (1.85)	5.00 – 13.00
TUG-cognitive (dominant leg), s	10.81 (3.02)	5.50 – 20.00
TUG-cognitive (non-dominant leg), s	10.61 (3.27)	5.50 – 19.21

Notes: s, second, TUG, Timed Up and Go



TABLE 3. Time difference between dominant leg and non-dominant leg turning during TUG standard and TUG cognitive among older adults (n = 50)

Factors	df1	df2	F	p value	Partial $\eta^2$
Dominant and non-dominant leg turning	1	49	0.069	0.79	0.001
TUG-standard and TUG-cognitive	1	49	62.495	<0.00	0.561
TUG*Dominant leg turning	1	49	1.529	0.22	0.030

Notes: TUG, Timed Up and Go; significant at  $p < 0.001$

tests among healthy older adults. This result is similar to results found in post-stroke adults, suggesting that turning directions does not have any significant effect on the time taken to complete TUG test (DeMorais-Faria et al. 2016). Our results support a previous study by Vaisman et al. (2017), that highlighted that no statistical difference was found in the maximal power between dominant and non-dominant legs among non-athletes ( $p = 0.316$ ) or single-leg-dominant professional soccer players ( $p = 0.281$ ).

In contrast, TUG performance time was reported to be shorter when turning to hemiparesis side among participants with stroke (Heung & Ng 2009). Turning time to affected side is expected to be longer compared to the unaffected side as reported by Chow 1997. Biomechanically, participants have to shift their weight onto the leg of the turning direction. Muscle weakness and impairment in the lower limb due to stroke, might explain the differences in the performance while turning to affected and unaffected side.

It can be deduced that the differences in factors related to bilateral lower limb motor impairment, pain level, muscle tone abnormality, distribution of muscle weakness and skills in using a walking aid among stroke survivors could have affected the results (Heung & Ng 2009). In another study among stroke survivors, it was shown that the average joint torques for the paretic leg were significantly lower than non-paretic leg for all movements tested (Lomaglio & Eng 2005). Moreover, patients with a hip fracture experienced knee-extension strength deficit of more than 50% in the fractured limb compared to the non-fractured limb (Kristensen et al. 2009).

We also found that healthy older adults took a longer time to complete TUG cognitive than TUG standard. This is possible given that the degree of difficulty for secondary task may affect the pattern in the primary task such as speed of gait (Vance et al. (2015). Adding a secondary cognitive task to TUG test provides more information regarding mobility and risk of

fall because it also measures the cognitive capacity in the performance of this dual task (Shumway-Cook et al. 2000). TUG dual task is known to place additional loads on the brain's executive function and interfere with motor control tasks such as walking (Coulthard et al. 2015).

To the best of our knowledge, there is no published research data on the difference between dominant and non-dominant leg turning in association to falls among healthy older adults. There is also limited insight about normal turning behaviour and the critical features of safe and efficient turning behaviour among older adults. Instructions for the TUG test were suggested as confusing in respect to which sides were participants supposed to turn when performing this test (Wall et al. 2000). More information about the turning behaviour in older adults is required.

One of the limitations of our study was that only time difference for turning between dominant and non-dominant side turning was investigated. Details of the characteristics of turning could provide more information about how it may affect turning time. For example, staggering (defined as loss of balance), the number of steps taken to turn and the type of turn used (from pivoting through to multiple steps) (Dite & Temple 2002).

The results of the present study provide information that there are no differences in the time taken to perform TUG regardless the turning side among older adults without lower limb impairments. It may also be important to test TUG cognitive in healthy older adults as it can provide valuable information in terms of functional postural stability and cognitive status while performing dual task activities.

## CONCLUSION

Our study findings showed that there is no significant time difference between dominant and non-dominant leg turning during TUG standard

and TUG cognitive. Therefore, when performing TUG test, health professionals can instruct healthy older adults to turn to their preferred side.

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### REFERENCES

- Allan, L. M., Ballard, C. G., Rowan, E. N., & Kenny, R. A. 2009. Incidence and prediction of falls in dementia: A prospective study in older people. *PLoS One*, 4(5), e5521.
- Bohannon, R.W. 2006. Reference values for the timed up and go test: a descriptive meta-analysis. *Journal of Geriatric Physical Therapy* 29(2): 64-68.
- Chow SL. 1997. Performance of timed 'Up & Go' test in female elderly patients with hip fracture. PhD dissertation. Hong Kong: *The Hong Kong Polytechnic University*.
- Coulthard, J. T., Treen, T. T., Oates, A. R., & Lanovaz, J. L. 2015. Evaluation of an inertial sensor system for analysis of timed-up-and-go under dual-task demands. *Gait & Posture* 41(4): 882-887.
- Cumming, R. G., & Klineberg, R. J. 1994. Fall frequency and characteristics and the risk of hip fractures. *Journal of the American Geriatrics Society* 42(7): 774-778.
- DeMorais-Faria, C. D. C., de Carvalho-Pinto, B. P., Nadeau, S., & Teixeira-Salmela, L. F. 2016. 180° turn while walking: characterization and comparisons between participants with and without stroke. *Journal of Physical Therapy Science* 28(10): 2694-2699.
- Dite, W., & Temple, V. A. 2002. Development of a clinical measure of turning for older adults. *American Journal of Physical Medicine & Rehabilitation* 81(11): 857-866.
- Gothe, N. P., Fanning, J., Awick, E., Chung, D., Wójcicki, T. R., Olson, E. A., Mullen, S.P., Voss, M., Erickson, K.I., Kramer, A.F., & McAuley, E. 2014. Executive function processes predict mobility outcomes in older adults. *Journal of the American Geriatrics Society* 62(2): 285-290.
- Hall, C. D., Echt, K. V., Wolf, S. L., & Rogers, W. A. 2011. Cognitive and motor mechanisms underlying older adults' ability to divide attention while walking. *Physical Therapy*, 91(7): 1039-1050.
- Heung, T. H., & Ng, S. S. 2009. Effect of seat height and turning direction on the timed up and go test scores of people after stroke. *Journal of Rehabilitation Medicine* 41(9): 719-722.
- Ibrahim, A., Singh, D. K. A., & Shahar, S. 2017. 'Timed Up and Go' test: Age, gender and cognitive impairment stratified normative values of older adults. *PLoS ONE* 12(10): e0185641.
- Ibrahim, A., Singh, D., Shahar, S., & Omar, M. A. 2017. Timed up and go test combined with self-rated multifactorial questionnaire on falls risk and sociodemographic factors predicts falls among community-dwelling older adults better than the timed up and go test on its own. *Journal of Multidisciplinary Healthcare* 10: 409-416.
- Kristensen, M. T., Bandholm, T., Bencke, J., Ekdahl, C., & Kehlet, H. 2009. Knee-extension strength, postural control and function are related to fracture type and thigh edema in patients with hip fracture. *Clinical Biomechanics* 24(2): 218-224.
- Lomaglio, M. J., & Eng, J. J. 2005. Muscle strength and weight-bearing symmetry relate to sit-to-stand performance in individuals with stroke. *Gait & Posture* 22(2): 126-131.
- Mathias, S., Nayak, U. S., & Isaacs, B. 1986. Balance in elderly patients: the "get-up and go" test. *Archives of Physical Medicine and Rehabilitation* 67(6): 387-389.
- Mesbah, N., Perry, M., Hill, K.D., Kaur, M., & Hale, L. 2017. Postural Stability in Older Adults with Alzheimer Disease. *Physical Therapy* 197(3): 290-309.
- Podsiadlo, D. & Richardson, S. 1991. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society* 39(2): 142-148.
- Rubenstein LZ. 2006. Falls in older people: epidemiology, risk factors and strategies for prevention. *Age and Ageing* 35(Suppl 2): ii37-ii41.
- Samah, Z. A., Singh, D. K. A., Murukesu R. R., Shahar, S., Nordin, N. A. M., Omar, M. A., & Chin, A. V. 2018. Discriminative and Predictive Ability of Physical Performance Measures in Identifying Fall Risk among Older Adults. *Sains Malaysiana* 47(11): 2769-2776.
- Shaharudin, M. I., Singh, D. K. A., Shahar, S., & Singh, D. K. A. Falls prevalence and its risk assessment tools among Malaysian community-dwelling older adults: A review. *Malaysian Journal of Public Health Medicine* 18(2): 35-38.
- Shumway-Cook, A., Brauer, S., & Woollacott, M. 2000. Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. *Physical Therapy* 80: 896-903.
- Shumway-Cook, A., & Woollacott, M. 2000. Attentional demands and postural control: the

- effect of sensory context. *Journals of Gerontology-Biological Sciences and Medical Sciences* 55(1): M10.
- Shumway-Cook, A., Woollacott, M., Kerns, K. A., & Baldwin, M. 1997. The effects of two types of cognitive tasks on postural stability in older adults with and without a history of falls. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 52(4), M232-M240.
- Singh, D. K., Pillai, S. G., Tan, S. T., Tai, C. C., & Shahar, S. 2015. Association between physiological falls risk and physical performance tests among community-dwelling older adults. *Clinical Interventions in Aging* 10: 1319.
- Springer, S., Giladi, N., Peretz, C., Yogev, G., Simon, E. S., & Hausdorff, J. M. 2006. Dual-tasking effects on gait variability: The role of aging, falls, and executive function. *Movement Disorders* 21(7): 950-957.
- Suttanon, P., Hill, K. D., Said, C. M., & Dodd, K. J. 2013. A longitudinal study of change in falls risk and balance and mobility in healthy older people and people with Alzheimer's disease. *American Journal of Physical Medicine & Rehabilitation*, 92(8), 676-685.
- Terroso, M., Rosa, N., Marques, A. T., & Simoes, R. 2014. Physical consequences of falls in the elderly: a literature review from 1995 to 2010. *European Review of Aging and Physical Activity* 11(1): 51.
- Thigpen, M.T., Light, K.E., Creel, G.L. & Flynn, S.M. 2000. Turning difficulty characteristics of adults aged 65 years or older. *Physical Therapy* 80(12): 1174-1187.
- Tinetti, M. E. 1986. Performance-oriented assessment of mobility problems in elderly patients. *Journal of the American Geriatrics Society* 34(2): 119-126.
- Toulotte, C., Thevenon, A., Watelain, E., & Fabre, C. 2006. Identification of healthy elderly fallers and non-fallers by gait analysis under dual-task conditions. *Clinical Rehabilitation* 20(3): 269-276.
- Vaisman, A., Guiloff, R., Rojas, J., Delgado, I., Figueroa, D., & Calvo, R. 2017. Lower Limb Symmetry: Comparison of Muscular Power Between Dominant and Nondominant Legs in Healthy Young Adults Associated with Single-Leg-Dominant Sports. *Orthopaedic Journal of Sports Medicine* 5(12): 2325967117744240.
- Vance, R. C., Healy, D. G., Galvin, R., & French, H. P. 2015. Dual tasking with the timed "up & go" test improves detection of risk of falls in people with Parkinson disease. *Physical Therapy* 95(1): 95-102.
- Wall, J. C., Bell, C., Campbell, S., & Davis, J. 2000. The Timed Get-up-and-Go test revisited: measurement of the component tasks. *Journal of Rehabilitation Research and Development* 37(1): 109.
- Whitney, J.C., Lord, S.R. & Close, J.C.T. 2005. Streamlining assessment and intervention in a falls clinic using the timed up and go test and physiological profile assessments. *Age and Ageing* 34(6): 567-71.
- Won, H., Singh, D.K., Din, N.C., Badrasawi, M., Manaf, Z.A., Tan, S.T., Tai, C.C., & Shahar, S. 2014. Relationship between physical performance and cognitive performance measures among community-dwelling older adults. *Clinical Epidemiology* 6: 343-350.
- Yang, L., He, C., & Pang, M. Y. C. 2016. Reliability and validity of dual-task mobility assessments in people with chronic stroke. *PloS one* 11(1): e0147833.

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## Ascariasis Among Orang Asli School Children at Kuala Kubu Bharu, Selangor

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### ABSTRACT

*Ascaris lumbricoides* is considered as the largest intestinal nematode which infects man. It has the highest prevalence in area where sanitation level is low. A total of 159 Orang Asli (aborigine) school children from Kuala Kubu Bharu, Selangor participated in this study. The faecal specimens were collected and examined for *A. lumbricoides* ova using direct faecal smear and formalin-ether concentration techniques. The prevalence of ascariasis among the aboriginal school children in Kuala Kubu Bharu was 38.4%. With regards to the gender wise, the prevalence of infection was higher in males (44.9%) compared to females (33.3%). School children aged 9 years old showed the highest infection rate at 68.4%. From this study, it was found that the infection rate among the Orang Asli school children in Kuala Kubu Bharu was high despite they lived in a semi urban area with a better sanitation as compared to those living in the deep rural area.

Key words : *Ascaris lumbricoides*; Orang Asli (aborigine); school children

### INTRODUCTION

*Ascaris lumbricoides* is one of the commonest helminths affecting human (Das et al. 2019). It causes important medical and social problems especially in the tropical and subtropical regions (Omotola & Ofoezie 2019). Infection of *A. lumbricoides* occurs in all age groups but it is commoner in children of preschool age in socioeconomic areas and with malnutrition and immune deficiencies (Joseph et al. 2014; Galgamuwa et al. 2018). Ascariasis is most common in children 2 to 10 years old and the prevalence of infection decreases over the age of 15 years. *A. lumbricoides* infection tends to cluster in families and worm burden correlates with the number of people living in a home (Elkins et al. 1986). In the early 1900s, the prevalence of *A. lumbricoides* infection in the United States decreased dramatically after the introduction of modern sanitation and waste treatment (Jones 1983). In Malaysia, prevalence of ascariasis in Ampang, Selangor and Beranang were 82% and 33% respectively (Lo et al. 1979). *Ascaris lumbricoides* infection in Kelantan on the other hand was 47.6% among rural school children (Mahendra et al. 1997). In heavy infection, *A. lumbricoides* may cause obstruction of the intestine by a mass of *A. lumbricoides* which may cause serious and lethal complications. The rate of mortality from intestinal obstruction is 5.7% below the age of 10 years (Khan & Ghauri 2016). This study aims to determine the prevalence of ascariasis among the

aboriginal school children who live in a semi urban area with better amenities.

### MATERIALS AND METHODS

#### Subjects and study area

A cross-sectional parasitological survey was carried out in an Orang Asli primary school at Kuala Kubu Bharu, in 2011. Kuala Kubu Bharu is a town in the district of Hulu Selangor, located some 50 km from Kuala Lumpur. The aboriginal school children are from the Temuan tribe. Stool containers were distributed to the students after an informed consent and 159 students aged between 7-12 years old participated comprising 69 boys and 90 girls.

#### Stool examination

The stool specimens were prepared for direct faecal smear and also fixed with 10% formalin for the formalin-ether concentration technique.

### RESULTS

A total of 159 faecal specimens were examined using direct smear and formalin-ether concentration techniques. Out of 159 school children, 61 (38.4%) were found to be positive for *A. lumbricoides* infection. The prevalence of ascariasis was higher in males (44.9%) compared to females (33.3%). With regards to the participants age, school children at the age of 9 years old show the highest prevalence of ascariasis (68.4%).

TABLE 1. Prevalence of *Ascaris lumbricoides* infection among aboriginal school children at Kuala Kubu Bharu, Selangor according to participants age

Participants age (years)	Number of samples examined	Number positive	Prevalence (%)
7	44	10	22.7
8	26	12	46.2
9	19	13	68.4
10	25	11	44.0
11	21	9	42.9
12	24	6	25.0

TABLE 2. Prevalence of *Ascaris lumbricoides* infection of aboriginal school children at Kuala Kubu Bharu, Selangor according to gender

Gender	Number of examined samples	Number of positive samples	Prevalence (%)
Males	69	31	44.9
Females	90	30	33.3

## DISCUSSION

High prevalence of ascariasis is usually associated with poverty, poor environmental conditions, lack of clean water and proper faecal disposal. The Orang Asli (aborigines) are the minority groups of people who dwell mainly in the tropical forests of the lowlands and hills in peninsular Malaysia (Sinniah et al. 2012). Several studies on parasitic infections conducted among the aborigines over the years showed the problem has not improved much (Noor Azian et al., 2007; Lim et al., 2009; Sinniah et al., 2010). *Ascaris lumbricoides* prevalence rate from 1970s to 2009 ranges between 4.6-86.7% (Ahmed et al. 2011). Several studies have demonstrated a high infection rate of ascariasis among aboriginal children in Malaysia (Norhayati et al. 1997; Mohamed Kamel et al. 2001) where the prevalence ranged between 33.3% - 69%. In this study, the overall prevalence of ascariasis was 38.4% which revealed that *A. lumbricoides* infection was common among the aboriginal school children in Kuala Kubu Bharu, Selangor. The highest prevalence rate of ascariasis in this study was seen in school children aged 9 years old which was 68.4%.

The results obtained in this study was more or less similar to other studies done in

Malaysia. In Bachok, Kelantan, the prevalence of ascariasis among 9-10 year old rural school children was 49.7% (Anees et al. 2003). In Pos Betau, Kuala Lipis, Pahang, a high prevalence rate of 67.8% was documented among the Orang Asli primary school children (Al-Mekhlafi et al. 2007). The overall prevalence of ascariasis in children in Pos Lenjang, Pahang was 42.3% (Hartini & Kamel 2010). Amongst children and older community living in the vicinity of the Crocker Range Park Sabah, prevalence rate of *A. lumbricoides* infection was 8.7% and was highest among children aged between 1-10 years old (Nor Aza et al. 2003). *Ascaris lumbricoides* infection was recorded at 29.2% in three different aboriginal villages in Perak (Sinniah et al. 2012). Previous studies have shown that the prevalence of ascariasis slowly declined in communities where good and safe environmental sanitation have been provided, practiced or when the resident's socio-economic status improved (Chan 1992; Arfaa et al. 1977 ; Norhayati et al. 1998).

Studies have also proven that by moving people from unhygienic condition to a better environmental condition without changing their economic status has significantly reduced the prevalence of soil-transmitted helminthes, including *A. lumbricoides* infection (Che Ghani

et al. 1989). A study done in villages in rural area in Malaysia indicated that provision of both piped water and improved sanitation has prevented the occurrence of ascariasis regardless of other socio-economic background of the community (Che Ghani & Oothuman 1991). In this study, the location of study was located near the Kuala Kubu Bharu town. The condition of the school was clean and equipped with treated piped water and good sanitation. Despite that, ascariasis remains prevalent and this could be attributed to the fact that the infection might have taken place elsewhere. Most of the students come from several smaller villages throughout the district of Hulu Selangor where the basic amenities were lacking. A lack of awareness on good hygienic care and personal hygiene may play important roles in the contracting the infection. Hence, there is a need for awareness campaigns in mass scale about health and hygiene in order to reduce *Ascaris* infections (Nguai et al. 2015).

Gender was not a significant risk factor for *Ascaris* infection (AI-Eissa et al. 1995; Desiyanti et al. 2017). However, a study in India showed a significant association between gender and of *Ascaris* intensity of infection (Elkins et al 1988). In this study, there is a difference in the prevalence rate of ascariasis among males compared to female school children, in which males were found to have a higher prevalence rate compared to females. More studies need to be done to determine ascariasis prevalence among aboriginal children in the more urbanized area with cleaner environment and better sanitation compared to the more rural aboriginal villages.

## CONCLUSION

From this study, it can be concluded that the prevalence of ascariasis is still high among aboriginal school children although they lived in a more urban area with better amenities. More studies on parasitic infestations need to be carried out among urban aboriginal children at different places in Malaysia.

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## REFERENCES

- Ahmed, A., Al-Mekhlafi, H.M. & Surin, J. 2011. Epidemiology of soil-transmitted helminthiases in Malaysia. *Southeast Asian J Trop Med Public Health*. 42(3):527-38.
- AI-Eissa, Y.A., Assuhaimai, S.A., Abdullah, A.M.A., Abo Bakar, A.M., AI-Husain, M.A., AI-Nasser, M.N. & AI-Borno, M.K. 1995. Prevalences of intestinal parasites in Saudi Arabia; a community-based study. *J Trop Paed* 41: 47-9.
- Al-Mekhlafi, M.S., Atiya, A.S., Lim, Y.A.L., Mahdy, A.K., Ariffin, W.A., Abdullah, H.C. & Surin, J. 2007 *An unceasing problem: soil-transmitted helminthiases in rural Malaysian communities*. *Southeast Asian J of Trop Med and Public Health* 38 (6):998-1007.
- Anees, A.H., Zulkifli, A., Azmi, A. & Syukri, M. 2003. Helminthiasis among primary rural school children in Bachok, Kelantan. *Malaysian J of Public Health Med* 3(2):19-22
- Arfaa, F., Sahba, G.H., Farahmandian, I. & Jalali, 1977. H. Evaluation of the effect of different methods of control of soiltransmitted helminths in Khuzestan, South-west Iran. *Am J Trop Med Hyg* 26 (2): 230-3.
- Chan, T.C. 1992. Family influence on the prevalence of soiltransmitted helminthiases among Chinese children in Macao. *Trop Biomed* 9: 9-14.
- Che Ghani, B.M., Noorhayati, M.I., Osman, A. & Mohd Hashim. 1989. Effects of rehousing and improved sanitation on the prevalence and intensity of soil-transmitted helminthiasis in urban in Kuala Lumpur. In: *Collected Papers on the Control of Soil-Transmitted Helminthiases Vol IV*, (Editors) Yokogawa M, et al., APCO, Tokyo 51-6.
- Che Ghani, B.M. & Oothuman, P. 1991. Patterns of soiltransmitter helminths infection in relation to types of water supply, housing facilities and availability of latrines in rural areas of peninsular Malaysia. In: *Collected Papers on the Control of Soil-Transmitted Helminthiases Vol V*, (Editors) Yokogawa M, et al., APCO, Tokyo 51-6.
- Das, S., Mukherjee, A., Mallick, S., Bhattacharjee, S., Chakraborty, S. & Dasgupta, S. 2019. Prevalence of soil-transmitted helminth infestations among children attending integrated child development service centers in a tea garden area in Darjeeling. *Trop Parasitol* 9(1): 23.
- Desiyanti, T. C., Hardjanti, A., Mahardhika, Z. P., Rachmawati, P., Rahman, R. F., Farellina, Y.

- I. & Wahyudi, Y. 2017. Prevalence And Levels Of Soil Transmitted Helminths (Sth) Infection Associated With Gender And Age In Cakung Public Elementary School On District Binuang Serang Banten Area. In *1st International Conference in One Health (ICOH 2017)*. Atlantis Press.
- Elkins, D.B., Haswell-Elkins, M. & Anderson, R.M. 1986. The epidemiology and control of intestinal helminthes in the public at lake region of southern India. Study design and pre- and post-treatment observation on *Ascaris lumbricoides* infection. Transactions Royal Society Tropical Medicine and Hygiene 80: 744-792.
- Elkins, D.B., Haswell-Elkins, M.R. & Anderson, R.M. 1988. The importance of host age and sex to patterns of reinfection with *Ascaris lumbricoides* following mass antihelminthic treatment in a South India fishing community. Parasitol 96: 171-84.
- Ferreira, C.S., Ferreira, M.U. & Noguera, M.R. 1994. The prevalence of infection by intestinal parasites in an urban slum in Sao Paulo, Brazil. J Trop Med Hyg 97: 121-127. 25.
- Galgamuwa, L. S., Iddawela, D. & Dharmaratne, S. D. 2018. Prevalence and intensity of *Ascaris lumbricoides* infections in relation to undernutrition among children in a tea plantation community, Sri Lanka: a cross-sectional study. BMC Pediatr 18(1): 13.
- Hartini, Y. & Mohamed Kamel, A.G.. 2010. *Ascariasis* among Orang Asli Children at Pos Lenjang, Pahang, Malaysia. Med & Health 5(2): 60-65
- Jones JE. 1983. Parasites in Kentucky: the past seven decades. J Ky Med Assoc 81:621
- Joseph, S.A., Casapia, M., Blouin, B., Maheu-Giroux, M., Rahme, E. & Gyorkos, T.W. 2014. Risk factors associated with malnutrition in one-year-old children living in the Peruvian Amazon. PLoS Negl Trop Dis 8(12): e3369.
- Khan, M.W. & Ghauri, S.K. 2016. Small bowel *Ascaris* infestation: a diagnostic challenge. Int J Gen Med 9: 99.
- Lim, Y.A.L., Romano, N., Colin, N., Chow, S.C. & Smith, H.V. 2009. Intestinal parasitic infections amongst Orang Asli (indigenous) in Malaysia: Has socioeconomic development alleviated the problem? Tropical Biomedicine 26(2):110-122.
- Lo, E.K.C., Varughese, J., Ghouse, A. & Noor, M. 1979. Helminthiasis in Peninsular Malaysia-Prevalence and density of infestation of hookworm, ascaris and trichuris in rural school children. Med J Malaysia 34(2):95-99
- Mahendra Raj, S., Sein, K.T., Khairul Anuar, A. & Mustaffa, B.E. 1997. Intestinal helminthiasis in relation to height and weight of early primary school children in North-eastern Peninsular Malaysia. Southeast Asian J Trop Med Public Health 28:314-320
- Mohamed Kamel, A.G., Sham, K., Karen, L., Norazah, A. 2001. Soil-Transmitted helminthiasis amongst the Orang Asli (aborigines) community in Pangsoon, Malaysia. Int. Med. J. 8(1):15-18.
- Nor Aza, S., Ashley, S. & Albert, J. 2003. Parasitic infections in human communities living on the fringes of the crocker range park, Sabah, Malaysia. ASEAN Review of Biodiversity and Environmental Conservation (ARBEC)
- Norhayati, M., Oothuman, P., Fatmah, M.S. 1998. Some risk factors of *Ascaris* and *Trichuris* infection in Malaysian aborigine (Orang Asli) children. Med J Malaysia 53(4):401-407.
- Norhayati, M., Zainuddin, B., Mohammad, C.G., Oothuman, P., Azizi, O., Fatmah, M.S.1997. The prevalence of *Trichuris*, *Ascaris* and Hookworm infection in Orang Asli children. Southeast Asian J. Trop. Med. Public Health 28(1):161-168.
- Noor Azian, M.Y., San, Y.M., Gan, C.C., Yusri, M.Y., Nurulsyamzawaty, Y., Zuhaizam, A.H., Maslawaty, M.N., Norparina, I. & Vythilingam, I. 2007. Prevalence of intestinal protozoa in an aborigine community in Pahang Malaysia. Trop Biomed 24(1): 56-62.
- Omotola, O.A. & Ofoezie, I.E. 2019. Prevalence and Intensity of Soil Transmitted Helminths among School Children in Ifetedo, Osun State, Nigeria. J Bacteriol Parasitol 10(352): 2.
- Sinniah, B., Rohela, M., Jamaiah, I., Amritpal, S., Ding, K.S., Lee, K.Y., Sanjeevan, R., Sim, S.T. & Elangovan, S. 2010. Intestinal parasitic infections in Malaysian school children. Journal Royal College Medicine Perak 1(1): 1-8.
- Sinniah, B., Sabaridah, I., Soe, M.M., Sabitha, P., Awang, I.P.R., Ong, G.P. & Hassan, A.K.R. 2012. Determining the prevalence of intestinal parasites in three Orang Asli (Aborigines) communities in Perak, Malaysia. Tropical Biomedicine 29(2): 200–206

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## Keberkesanan Antibiotik titisan mata Chloramphenicol terhadap Sista *Acanthamoeba* spp. Isolat Klinikal

(Effectiveness of Chloramphenicol Eye drops on Clinical Isolates Cysts of *Acanthamoeba* spp.)

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### ABSTRAK

*Acanthamoeba* spp. boleh mengakibatkan keratitis kepada manusia yang sihat, malah berisiko tinggi kepada pemakai kanta sentuh yang tidak menitikberatkan penjagaan higen. Kajian ini bertujuan untuk mengkaji keberkesanan antibiotik titisan mata Chloramphenicol terhadap sista *Acanthamoeba* isolat klinikal iaitu HKL 5, HKL 11, HKL 32, dan HKL 51. Kajian ini dimulakan dengan melakukan suspensi sista terhadap keempat-empat isolat klinikal tersebut. Mikropencairan terhadap antibiotik dilakukan dan kemudiannya suspensi sista ditambah, seterusnya dieramkan selama 24 jam pada 30°C sebelum dipindahkan ke atas plat agar bukan nutrien (NNA) yang dilapisi *E. coli* matian haba. Plat agar diperhatikan setiap hari sehingga hari yang ke-14 untuk mengesan kehadiran trofozoit di bawah mikroskop kebalikan. Chloramphenicol didapati tidak mempunyai kesan anti-*Acanthamoeba* dan gagal menginaktivasikan kesemua sista isolat klinikal *Acanthamoeba* dan dengan itu tidak sesuai digunakan untuk rawatan keratitis *Acanthamoeba*.

Kata kunci : Antibiotik titisan mata; Chloramphenicol; *Acanthamoeba*

### ABSTRACT

*Acanthamoeba* spp. may infect healthy individual and cause keratitis especially amongst the contact lens wearers who do not practice good hygienic care. This study aims to evaluate the effectiveness of Chloramphenicol on four clinical isolates of *Acanthamoeba* cysts consisting HKL 5, HKL 11, HKL 32, and HKL 51. Cysts suspensions of all 4 clinical isolates of *Acanthamoeba* were prepared. Microdilution of antibiotic was prepared and cyst suspension was added and later incubated at 30°C for 24 hours before being transferred onto non-nutrient agar (NNA) plates seeded with heat-killed *E. coli*. The plates were observed daily until day 14 to detect the presence of trophozoites under inverted microscope. Chloramphenicol does not exhibit anti-*Acanthamoeba* activity and failed to inactivate all the clinical isolate cysts and therefore is not suitable to be used for the treatment of *Acanthamoeba* keratitis.

Keywords : Topical antibiotic eyedrop; Chloramphenicol; *Acanthamoeba*

### PENDAHULUAN

*Acanthamoeba* adalah patogen oportunistik yang boleh menyebabkan penyakit keratitis *Acanthamoeba* (AK), Ensefalitis Amebik bergranuloma (GAE) serta lesi kutaneus pada manusia. (Khan 2006; Visvesvara et al. 2007). Keratitis *Acanthamoeba* (AK) biasanya adalah berkaitan dengan pemakaian kanta sentuh (Gagnon & Walter 2006) dan ini dianggap sebagai faktor risiko paling penting terhadap berlakunya jangkitan ini.

Pemakaian kanta sentuh kini semakin popular di seluruh dunia (Hay et al. 1994), yang bertujuan untuk menambahbaik penglihatan dan juga untuk kepentingan kosmetik. Menurut Anne (2001), 5% daripada populasi rakyat Malaysia gemar memakai kanta sentuh. Peningkatan penggunaan kanta sentuh juga

dilihat selari dengan peningkatan prevalens keratitis *Acanthamoeba*

Di Malaysia, sejak kes pertama AK dilaporkan pada tahun 1995 (Kamel & Norazah, 1995), bilangan kes terus meningkat sejajar dengan peningkatan penggunaan kanta sentuh (Kamel et al. 2005; Mohamed Kamel et al. 2018). Beberapa antibiotik titisan mata yang terdapat di pasaran seperti Gentamycin dan Neomycin telah pernah digunakan dalam rawatan keratitis *Acanthamoeba* (Kamel et al. 2004, Mohamed Kamel et al. 2000). Chloramphenicol juga merupakan antibiotik titisan mata yang mudah didapati di pasaran tempatan. Oleh yang demikian, kajian ini dijalankan untuk menguji keberkesanan antibiotik titisan mata Chloramphenicol terhadap isolat *Acanthamoeba* tempatan.

## BAHAN DAN KAEDAH

Isolat *Acanthamoeba* yang digunakan dalam kajian ini berasal daripada kes AK dan terdiri daripada HKL 5, HKL 11, HKL 32, dan HKL 51. Antibiotik titisan mata Chloramphenicol digunakan dalam kajian ini. Kaedah penentuan nilai sistisidal minimum (MCC) yang dilakukan adalah berdasarkan kaedah Narasimhan dan rakan-rakan (2002).

Suspensi sista *Acanthamoeba* divorteks selama 1 minit sebelum digunakan supaya sista bertaburan sama rata dalam larutan salin PAGE. Sebanyak 10 µl suspensi sista dipipet masuk ke dalam telaga mikrotiter yang telah mengandungi 100 µl antibiotik. Sista akan dimasukkan ke dalam semua telaga kecuali telaga untuk kawalan negatif. Terdapat dua kawalan positif dan dua kawalan negatif. Kawalan positif yang pertama adalah terdiri daripada larutan PAS dan sista, manakala yang kedua adalah terdiri daripada sista dan larutan 3% hidrogen peroksida (H<sub>2</sub>O<sub>2</sub>). Kawalan negatif pertama hanya mengandungi larutan PAS dan kawalan negatif kedua pula hanya mengandungi larutan agen antimikrob. Campuran akan dibiarkan selama 24 jam (Kilvington et al. 2002).

Selepas 24 jam eramannya di dalam inkubator bersuhu 30°C, campuran di setiap telaga akan dipipet masuk ke dalam vial 1.5 ml yang berlainan. Telaga mikrotiter kemudiannya akan dibilas dengan 100 µl larutan salin PAGE untuk memastikan tiada sista yang tertinggal dalam telaga mikrotiter dan juga bertujuan menyingkirkan agen antimikrob yang terdapat di

sekeliling sista. Cucian itu dilakukan sebanyak tiga kali. Campuran kemudian diemparkan pada halaju 740 xg selama 5 minit untuk mendapatkan mendapan sista. Supernatan di bahagian atas vial akan dibuang dan mendapan dibawahnya akan dipindahkan terus ke atas agar bukan nutrien (NNA) yang telah dititiskan dengan suspensi *Escherichia coli* matian haba pada hari sebelumnya. Selepas itu, semua piring petri ditutup dan dieramkan pada suhu 30°C selama 48 jam. Agar diperhatikan setiap hari selama 14 hari dibawah mikroskop *inverted* untuk mengesan kehadiran sista dan trofozoit *Acanthamoeba*. Jika tiada pertumbuhan trofozoit *Acanthamoeba* berlaku dalam masa 14 hari, maka agen antibiotik yang digunakan adalah berkesan dalam membunuh sista *Acanthamoeba*.

Apabila kajian keberkesanan antibiotik terhadap sista *Acanthamoeba* dibuktikan dapat membunuh sista *Acanthamoeba*, kajian kepekatan sistisidal minimum (MCC) dilakukan terhadap antibiotik tersebut dengan kaedah yang sama tetapi dengan kepekatan yang berbeza dengan kajian keberkesanan.

## HASIL

Chloramphenicol didapati tidak mempunyai kesan anti-*Acanthamoeba* dan gagal membunuh semua sista isolat klinikal *Acanthamoeba* (Jadual 1). Kesemua sista dapat bereksistensi menjadi peringkat trofozoit. Kesemua kawalan positif dan negatif berfungsi dengan baik serta memberikan keputusan yang dijangkakan.

JADUAL 1. Keberkesanan Chloramphenicol terhadap sista *Acanthamoeba* spp. isolat klinikal.

Isolat	Chloramphenicol (5000 µg/ml)
HKL 5	X
HKL 11	X
HKL 32	X
HKL 51	X

Petunjuk:

- √ Berkesan (Trofozoit tidak hadir)
- X Tidak berkesan (Trofozoit hadir)

## PERBINCANGAN

Chloramphenicol sebagai sediaan dalam bentuk titisan mata yang digunakan dalam kajian

mengandungi 5mg/ml chloramphenicol dan pengawetnya adalah fenilmerkuri nitrat 2mg/ml. Chloramphenicol merupakan antibiotik yang sering digunakan untuk merencat tindakan

bakteria gram negatif dan positif, *Rickettsia*, *Chlamydia* dan *Mycoplasma*. Ia adalah agen bakteriostatik, walaupun begitu, dalam keadaan tertentu ia boleh menjadi agen bakterisidal terhadap sesetengah spesies. Hasil kajian menunjukkan bahawa antibiotik titisan mata Chloramphenicol adalah tidak berkesan terhadap kesemua sista *Acanthamoeba* isolat klinikal. Chloramphenicol sememangnya bersifat bakteriostatik sahaja terhadap bakteria dan bukan merupakan agen anti-ameba apatah lagi bila diuji terhadap sista *Acanthamoeba* yang resistan. Mod tindakannya adalah dengan mengikat pada ribosom 50S dan merencat aktiviti *peptidyl transferase* pada bakteria. Maka, perkembangan rantai polipeptida semasa sintesis protein dapat dihalang.

Beberapa jenis antibiotik titisan mata seperti gentamicin dan neomycin pernah digunakan dalam rawatan keratitis *Acanthamoeba* di dalam mahupun di luar negara (Kamel et al. 2004, Mohamed Kamel et al. 2000). Hasil kajian ini turut disokong oleh kajian terdahulu Noradilah et al. 2009 dan 2012. Biasanya apabila antibiotik digunakan dalam rawatan AK, ia melibatkan kombinasi dengan agen antimikrob yang lain seperti propamidine, PHMB atau chlorhexidine.

Antibiotik titisan mata Ciprofloxacin 3mg/ml juga pernah diuji keberkesanannya terhadap sista *Acanthamoeba* pencilan klinikal di Malaysia (Mohamed Kamel et al. 2019) dan ia didapati berkesan dan berpotensi digunakan sebagai rawatan sampingan untuk AK.

## KESIMPULAN

Chloramphenicol tidak menunjukkan keberkesanannya terhadap sista *Acanthamoeba* isolat klinikal dengan itu ia tidak sesuai digunakan untuk rawatan keratitis *Acanthamoeba*.

## RUJUKAN

- Anne, C.K.T. 2001. Visual benefits with contact lenses. Medical Journal of Malaysia supplement. 56:37.
- Gagnon, M. R. & Walter, K. A. 2006. A case of *Acanthamoeba* keratitis as a result of a cosmetic contact lens. Eye and Contact Lens. 32(1):37-38.
- Hay, J., Kirkness, C. M., Seal, D. V., Wright, P. 1994. Drug resistance and *Acanthamoeba* keratitis: the quest for alternative antiprotozoal chemotherapy. Eye. 8:555–563.
- Kamel, AGM, Faridah H, Yusof S, Norazah A & Nakisah MA. 2004. A Case of trauma related *Acanthamoeba* keratitis. Tropical Biomedicine 21;2: 135-138.
- Kamel, A.G.M, & Norazah, A. 1995. First case of *Acanthamoeba* keratitis in Malaysia. Transactions of Royal Society of Tropical Medicine and Hygiene 89:652.
- Kamel A.G.M, Haniza, H. Anisah, N. Yusof, S. Faridah, H. Norhayati, M. & Norazah, A. 2005. More *Acanthamoeba* keratitis cases in Malaysia. International Medical Journal 12 (1): 7-9.
- Khan, N. A. 2006. *Acanthamoeba*: biology and increasing importance in human health. Federation of European Microbiological Societies Microbiology Reviews. 30: 564–595.
- Kilvington, S., Hughes, R., Byas, J. & Dart, J. 2002. Activities of therapeutic agents and myristamidopropyl dimethylamine against *Acanthamoeba* isolates. Antimicrobial Agents and Chemotherapy. 46(6):2007-2009.
- Mohamed Kamel, Faridah Hanum, Norazah A, Noor Rain A, Hay J and Seal D. 2000. A case of waterborne contact lens associated *Acanthamoeba* keratitis from Malaysia: Successful treatment with Chlorhexidine and Propamidine. International Medical Journal 7: 63-65.
- Mohamed Kamel AG, Irdawati Azhar, Haliza AM, Anisah N, Yusof S, Noraina AR & Norazah A. 2018. *Acanthamoeba* Keratitis in Malaysia. Sains Malaysiana 47(7)1563–1569.
- Mohamed Kamel AG, Tang PY, Anisah N, Yusof S, Noraina AR & Norazah A. 2019. The Effectiveness of Ciprofloxacin, Fluconazole and Amphotericin B against Clinical Isolates of *Acanthamoeba* Cysts. International Medical Journal 26:2:106 – 108.
- Narasimhan, Sandhya, M. S., Madhavan, Hajib, N. M. D. & Therese, K. L. 2002. Development and application of an in vitro susceptibility test for *Acanthamoeba* species isolated from keratitis to *polyhexamethylene biguanide* and *chlorhexidine*. Journal of Cornea and External Disease. 21(2):203-205.
- Noradilah S.A., Mohamed Kamel A. G., Anisah N., Yusof S. & Noraina A. R. 2009. Keberkesanan antibiotik titisan mata Neomycin, Gentamycin dan Ciprofloxacin terhadap sista *Acanthamoeba* spp. Malaysian Journal of Health Sciences 7(2) 2009:39-46.

Noradilah SA, Mohamed Kamel AG, Anisah N, Noraina AR & Yusof S. 2012. The effectiveness of Gentamicin against *Acanthamoeba* cysts in-vitro. 2012. Malaysian Journal of Medicine and Health Sciences 8(2): 51–54.

Visvesvara, G.S., Moura, H., & Schuster, F.L. 2007. Pathogenic and opportunistic free-living amoebae: *Acanthamoeba* spp., *Balamuthia mandrillaris*, *Naegleria fowleri*, and *Sappinia diploidea*. Federation of European Materials Societies of Immunology and Medical Microbiology. 50: 1–26.

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## **A Review of Work Readiness and Job Satisfaction Among Occupational Therapist**

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FARAHYAH WAN YUNUS

### **ABSTRACT**

The preparation of graduates who are 'employable' and 'work-ready' has become increasingly important. Students need to be 'job ready' on graduation to engage immediately and effectively within their workplace. Job satisfaction is an important research area for several reasons. This review was conducted to explore the work readiness and job satisfaction among occupational therapist. Studies included in this review were identified by keyword searches from EBSCO Medline, EBSCO Psycinfo, and EBSCO ERIC databases. Manual searches from the reference lists of the included studies was also conducted. Work readiness and job satisfaction has been identified as an important component during the transition from an occupational therapy student to an occupational therapist at work. Further research on work readiness and job satisfaction of occupational therapist can contribute to promoting the welfare of occupational therapists as well as the quality of service delivered.

Keywords: work readiness, preparedness for practice, job satisfaction, occupational therapist, transition experiences

### **INTRODUCTION**

Department of Statistics in Malaysia reported that, in general, the Malaysian unemployment rate of labour force in October 2018 stood at 3.3%, marking an increase of 2.4% compared to October 2017. Among unemployed fresh graduates in Malaysia, degree holders constitute the highest percentage of unemployment at 26%. From the graduate unemployment percentage, 50% of the graduates were from public universities (National Education Statistics : Higher Education Sector 2017).

Lack of industrial training and work experience were highlighted by Omar and Rajoo (2016) in the International Journal of Economics, Commerce and Management as primary reasons for graduate unemployment in Malaysia. A study conducted by Graham and Mckenzie (1995), suggested that the study-to-work transition is crucial in preparing students for work. Graduates leave school and transitions from school to workplace with the assumption that they are fully prepared. However, employers criticise their lack of suitable skills and qualifications that meet the needs of employment industry. These unemployed graduates were also found to have weaker employability skills (Ismail et al. 2011).

The study-to-work transition is an important time for graduates to develop their own identity and understand the meaning of a career (Stokes & Wyn 2007). Employers' perception towards Malaysian graduates revealed

that 17% of employers were not satisfied with graduates from public universities, compared to graduates from private and foreign universities in Malaysia (Cheong et al. 2016).

Work readiness can be defined as the extent to which graduates are perceived to possess the attitude and attributes to make them prepared or ready for success in the work environment (Caballero et al. 2011). The preparation of graduates who are 'employable' and 'work-ready' has become increasingly important. Students need to be 'job ready' on graduation to engage immediately and effectively within their workplace (Billett 2009). Employability was also found to be less to the act of 'securing' the job, and more to the ability to be successful, to feel empowered, to adapt and change (Harvey 2005).

There is evidence that graduates may not be well prepared for the realities of employment no matter how well the educators prepare them to be. Communication capacity were identified as a major problem for university graduates in a multidisciplinary study (Litchfield et al. 2010). In a study among British occupational therapy graduates on their fitness to practise, differences between the experiences of new graduates, and the expectations of supervisors and employers were uncovered (Barnitt & Salmond 2000). New therapists were identified as being unprepared for the pressures of the work environment, contributing to disillusionment, which the authors stated, could impact negatively on

retention and lead to health problems. Supervisors appeared to want proficiency in technical skills, and employers (presumably managers of both graduates and their supervisors) wanted global skills that would benefit the whole service such as organisational, reflective and problem solving skills.

Job satisfaction is defined as the attitude a worker has towards his or her profession (Weiss 2002) and is often expressed as a pleasurable response of liking and disliking the work itself, the rewards such as pay, promotions, recognition or the contexts, working conditions and colleagues (Vandenbos 2007). Job satisfaction is an important research area for several reasons. In Anglo-American literature, it has been found crucial to ensure quality of work, decrease job attrition, promote personal growth and maintain physical and psychological health (Painter et al. 1995). Health professionals who experience poor wellbeing at work such as high levels of burnout or low levels of job satisfaction, are more likely to leave their positions (Hayes et al. 2006) and are less likely to provide services of the highest quality (Aiken et al. 2012).

The objective of this review is to summarize and integrate the extant literature dealing with job satisfaction and work readiness among Occupational Therapist during the transition from Occupational Therapy student to an Occupational Therapist at work.

## METHODOLOGY

### Search process

Articles were retrieved from an initial search for qualitative and quantitative studies involving work readiness and job satisfaction among occupational therapist. The final selection was based on these inclusion criteria: i) job satisfaction ii) work readiness and iii) occupational therapy. The exclusion criteria were: i) studies on burnout and ii) turnover. Accessible studies published from 2006 to 2017 were included in the search. The sources of the previous studies were electronic databases such as EBSCO Medline, EBSCO Psycinfo and EBSCO ERIC databases. Keywords searched included 'work readiness', 'preparedness for practice', 'job satisfaction' in combination 'occupational therapist' in which 'transition experiences' yielded the most relevant materials. Manual searches from the reference lists of the primary articles were also conducted.

### Data extraction

In keeping with a standardised assessment of data extraction, a framework was used as a guidance of the review procedures (Spencer et al. 2003). It has tools consisting of appraisal questions that covers the different stages of assessment process; findings, design, sampling, data collection, analysis, reporting, reflexivity and neutrality and ethics and auditability. Four ratings were used for the quality assessment, low, medium, high and very high. The ratings and their specific requirements are tabulated in Table 1.

## RESULTS

The keywords used in the initial search were work readiness, preparedness for practice, job satisfaction, occupational therapist and transition experiences. From the initial search, using three main databases, 612 studies were identified for possible and relevant inclusion. After abstract evaluation or full study review, 554 studies were excluded and 58 studies were retrieved for detailed examination. Out of these 58 studies, only ten study met the criteria. The searches yielded five studies that were selected for quality assessments in which five of them were quantitative studies (Doherty et al. 2009; Hodgetts et al. 2007; McCombie & Antanavage 2017; Scanlan & Still 2013; Sewpersadh et al. 2016) and four were qualitative studies (Brockwell et al. 2009; Moore et al. 2006; Robertson & Griffiths 2009; Tariah et al. 2011). Manual searches from the reference lists of the articles were also conducted. This method yielded a quantitative study (Gray et al. 2012) (Flowchart 1).

Table 2 and Table 3 show the framework that was used for data extraction. Most of the studies have a clear purpose of study, relevant literature review and has sample size that was described in detail and justified. Most of the studies also have appropriate analysis method, conclusion and reported the clinical importance of their study. Table 4 and 5 show the key metric for work readiness and job satisfaction on selected studies. The quality assessment for most of the studies in this review was range from medium to very high. Most of the studies used either semi-structured interviews, phone call interviews, online survey, focus group discussion or combination of these methods.

TABLE 1. Quality assessment guidelines

Rating	Requirements
Low	Data too invariable, due to inadequate analysis or sampling strategy ; data do not "ring true" and it appears that the authors had superimposed their own set of ideas
Medium	Analysis descriptive in nature and somewhat "thin" in describing context and detail, leading to appearance of superficiality
High	Descriptive but including a more adequate level of analysis, with consideration of context, presentation of a more nuanced picture of study participants and the complex environment in which they function
Very high	Required a theoretical focus, with consideration of the internal processes involved in creating the situation that was being described (for example, links to macro structures), and with an explanatory value that could be transferred to other research areas

FLOWCHART 1. Flowchart detailing stages of narrative review

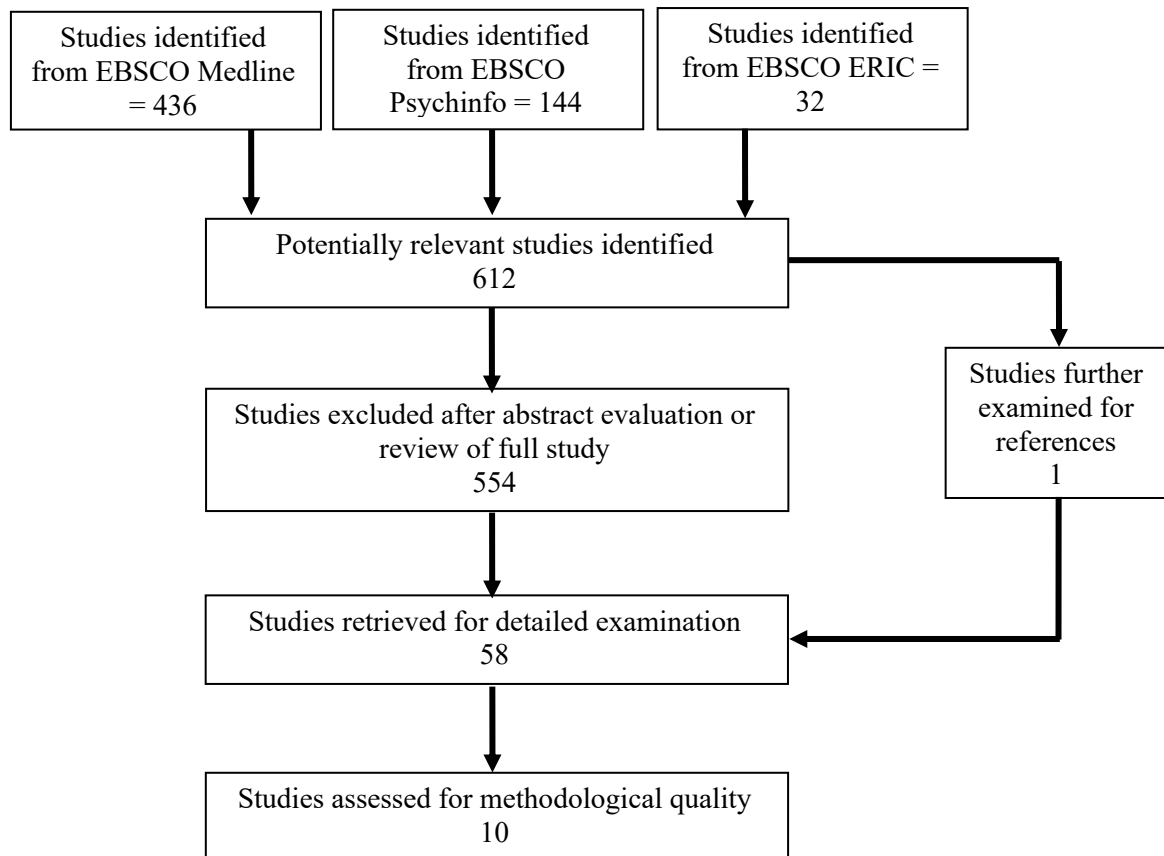


TABLE 2. Appraisal questions for studies included in Work Readiness

	(Hodgetts et al. 2007)	(Doherty et al. 2009)	(Robertson & Griffiths 2009)	(Brockwell et al. 2009)	(Gray et al. 2012)
<b>Study purpose</b>					
Was the purpose clearly stated?	✓	✓	✓	✓	✓
<b>Literature</b>					
Was relevant background literature reviewed?	✓	✓	✓	✓	✓
<b>Sample</b>					
Was the sample described in detail?	✓	✓	✓	✓	✓
Was sample size justified?	✓	✓	✓	✓	✓
<b>Outcomes</b>					
Were the outcome measures reliable?	NA	NA	NA	NA	NA
Were the outcome measures valid?	NA	NA	NA	NA	NA
<b>Intervention</b>					
Intervention was described in detail?	NA	NA	NA	NA	NA
Contamination was avoided?	NA	NA	NA	NA	NA
Co-intervention was avoided?	NA	NA	NA	NA	NA
<b>Results</b>					
Results were reported in terms of statistical significance?	✓	✓	NA	NA	✗
Were the analysis method(s) appropriate?	✓	✓	✓	✓	✓
Clinical importance was reported?	✓	✓	✓	✓	✓
Drop-outs were reported?	✗	✗	✗	✗	✗
<b>Conclusions and Implications</b>					
Conclusions were appropriate given study methods and results	✓	✓	✓	✓	✓

NA=Not applicable; ✗=No; ✓ =Yes



TABLE 3. Appraisal questions for studies included in Job Satisfaction

	(Moore et al. 2006)	(Tariah et al. 2011)	(Scanlan & Still 2013)	(Sewpersadh et al. 2016)	(McCombie & Antanavage 2017)
<b>Study purpose</b>					
Was the purpose clearly stated?	✓	✓	✓	✓	✓
<b>Literature</b>					
Was relevant background literature reviewed?	✓	✓	✓	✗	✓
<b>Sample</b>					
Was the sample described in detail?	✓	✓	✓	✓	✓
Was sample size justified?	✓	✓	✓	✗	✓
<b>Outcomes</b>					
Were the outcome measures reliable?	NA	NA	NA	NA	NA
Were the outcome measures valid?	NA	NA	NA	NA	NA
<b>Intervention</b>					
Intervention was described in detail?	NA	NA	NA	NA	NA
Contamination was avoided?	NA	NA	NA	NA	NA
Co-intervention was avoided?	NA	NA	NA	NA	NA
<b>Results</b>					
Results were reported in terms of statistical significance?	NA	NA	✓	✗	✓
Were the analysis method(s) appropriate?	✓	✓	✓	✓	✓
Clinical importance was reported?	✓	✓	✓	✓	✓
Drop-outs were reported?	✗	✗	✗	✗	✓
<b>Conclusions and Implications</b>					
Conclusions were appropriate given study methods and results	✓	✓	✓	✓	✓

NA=Not applicable; ✗ =No; ✓ =Yes

TABLE 4. Key metrics and findings for included studies in Work Readiness

Study	Location	Type/Method	Participants	Recruitment	QA	Focus of study
(Hodgetts et al. 2007)	Edmonton, Canada	Quantitative/Structured survey, focus group, telephone interviews	(n=85) recent occupational therapy graduates and (n=159) long term occupational therapy graduates	Occupational therapist from the graduating classes of 2001 to 2005 of a university	High	Perspectives of occupational therapy students and graduates regarding satisfaction with their professional education and preparedness for practice
(Doherty et al. 2009)	Geelong, Australia	Quantitative/Self-administered questionnaire	(n=18) Bachelor of Occupational Therapy graduates	Occupational therapist who graduated in 2005 from the first cohort of students from a university	High	Graduates perception on preparedness for practice
(Robertson & Griffiths 2009)	Otago, New Zealand	Qualitative/Focus group discussion	(n=15 to n=24) Three focus groups of graduates . Each groups with five to eight participants	Past graduates of occupational therapy degree course	High	Perceptions of graduates regarding their preparedness for practice
(Gray et al. 2012)	Australia, Aotearoa /New Zealand	Quantitative/Online survey	(n=178) newly graduated occupational therapist from Australia and (n=53) newly graduated occupational therapist from Aotearoa /New Zealand	Occupational therapy registration boards, snowball sampling	High	Perceptions of graduates regarding their education and work preparedness
(Brockwell et al. 2009)	Queensland, Australia	Qualitative/Self-report questionnaires and semi structured in-depth telephone interviews	(n=15) graduates from the first cohort of a university	First cohort of occupational therapy graduates from a university	Medium	Graduates perceived preparedness for practice and their work destinations

\*QA=quality assessment

TABLE 5. Key metrics and findings for included studies in Job Satisfaction

Author	Location	Study/Method	Participant	Recruitment	QA	Focus of study
(Moore et al. 2006)	New South Wales, Australia	Qualitative/Individual, semi structured interviews	(n=14) occupational therapists working in the health sector of the greater metropolitan area of Sydney	Occupational therapists working in the health sector of the greater metropolitan area of Sydney, NSW	High	Factors that contribute to job satisfaction
(Tariah et al. 2011)	Amman, Jordan	Qualitative/Explorative qualitative study, structured open-ended written questionnaires	(n=93) occupational therapists in hospitals, special education centres, rehabilitation centres and schools	Hospitals, special education centres, rehabilitation centres and schools	High	Factors influencing job satisfaction and dissatisfaction
(Scanlan & Still 2013)	Sydney, Australia	Quantitative/Survey (pen and paper and online)	(n=34) occupational therapists in a metropolitan public mental health service	All staff of a large metropolitan public mental health service	Medium	Factors related to job satisfaction of occupational therapist
(Sewpersadh et al. 2016)	South Africa	Quantitative/Cross-sectional survey, online	(n=49) occupational therapist in various settings	Occupational therapists working in various settings	Medium	Job satisfaction of occupational therapists
(Mccombie & Antanavage 2017)	United States	Quantitative/Multipage questionnaire including both open and closed-ended questions	(n=202) occupational therapist with American Occupational Therapy Association (OTA) membership	Members of the American Occupational Therapy Association	Very high	Transition of occupational therapy student to practising occupational therapist

\*QA=quality assessment

### Work readiness

Hodgetts et al. (2007) explored the perspectives of occupational therapy students and graduates on satisfaction with their professional education and preparedness for practice while Gray et al. (2012) studied feelings of preparedness for practice among new graduate occupational therapists in Australia and Aotearoa (New Zealand). Gray et al. (2012) reported only 17.1% of Australian new graduates and even fewer, 8.5% of Aotearoa (New Zealand) new graduates felt very well prepared. Professional competency ranked lowest for both graduate groups for ability to demonstrate occupational therapy techniques to students or demonstrate the role of occupational therapy, evaluate occupational therapy programmes within the organisation or evaluate the effectiveness of activities, plan

intervention based on evidence-based practice or use professional literature and resources and present clearly written evaluation reports to team members.

Doherty et al. (2009) noted that graduates felt adequately prepared to enter the occupational therapy profession and workforce. These findings showed that graduates perceived self-confidence was related to confidence in clinical decision-making, a positive self-view of knowledge and skills for practice on completion of their degree, a positive self-view of knowledge and skills for practice since being employed and an overall perception that their undergraduate program prepared them to enter the workforce and practice as an occupational therapist.

Similarly, a study on the reflections of new graduates on their preparation for practice was reported by (Robertson & Griffiths 2009). Three themes that were clearly identified in the focus groups of this study were the purpose of supervision, the shift from 'knowing about' to 'knowing how', and the need for multiple types of communication skills. The challenges faced by new graduates during their practice were searching for role clarity as an individual and team player, inadequate supervision by employers, lack of skills and uncertainty in team responsibility, coupled by a lack of confidence. However, they were able to research and find information in response to gaps in their knowledge.

Brockwell et al. (2009) conducted a study to ascertain graduate perceived preparedness for practice from a regional occupational therapy program. They compared the preparedness of practice between rural and urban therapists graduated from the same university. This study concluded that the rural therapists in this study appeared to perceive all subjects within the curriculum useful in preparing them for the workforce, compared with their urban counterparts.

#### **Job satisfaction**

Moore et al. (2006) explored factors that contributed to job satisfaction among occupational therapists working in the health sector of the greater metropolitan area of Sydney. This study concluded that job satisfaction in occupational therapy was derived from the sense of achievement felt when providing effective clinical care. Job dissatisfaction stemmed from the poor profile and status of the profession. Job satisfaction can also be increased by promoting measures to ensure clinical effectiveness and by enhancing the profile of occupational therapy.

Similarly, another study was conducted by Scanlan and Still (2013) to examine factors related to job satisfaction in a group of therapist in mental health. Job satisfaction was associated with rewards such as remuneration and recognition as well as cognitively challenging work. Results from this study suggested that occupational therapy educators and mental health managers should focus more on promoting self-care and support strategies to enhance resilience, in improving management and leadership styles and promoting therapeutic optimism through the adoption of recovery-oriented practice principles.

A qualitative study by Tariah et al. (2011) studied factors that influenced job satisfaction and dissatisfaction among Jordanian occupational therapist. This study revealed four themes related to job satisfaction, 'a humanistic profession', 'professional issues', 'work benefits' and 'work environment'. One theme was revealed for improving job satisfaction, 'a call for improvement'. This study also suggested that a collaboration between individual practitioners, representatives of the profession, government and hospital administrators is necessary to enhance occupational therapy profile in Jordan.

Mccombie and Antanavage (2017) examined the transition from occupational therapy students to practicing occupational therapists over the course of one's first year of professional employment. This study revealed that having a strong mentor was the primary determinant for high job satisfaction. Recommendations such as providing senior mentor or an experienced supervisor as a source for professional guidance and personal support was also made.

Another study conducted by Sewpersadh et al. (2016) on occupational therapist working in various setting in South Africa revealed that occupational therapist experienced the highest level of satisfaction with the nature of their work, operating conditions and working with co-workers whilst salary was a major source of dissatisfaction. Recommendation was made to employing bodies to evaluate components of job satisfaction amongst occupational therapists to ensure that suitable career path opportunities are developed for them as part of the retention policy of the employing body.

#### **DISCUSSION AND CONCLUSION**

This study summarized and integrated the extant literature dealing with work readiness and job satisfaction among Occupational Therapist during the transition from Occupational Therapy student to Occupational Therapist at work.

Transition from student to therapist inflicts anxiety among students approaching the end of their educational program and also among graduates as they prepare to enter the workforce (Hodgetts et al. 2007). Anxiety alone is not the only common perception for them (Tryssenaar & Perkins 2001). These students and recent graduates also experience feeling of inadequate preparation to enter workforce in terms of practical skills (Hodgetts et al. 2007).

Other studies on students' perceptions also reported similar findings (Lee & Mackenzie 2003; Tryssenaar & Perkins 2001). However, long term graduates remarked that they felt better prepared for their work after changing their positions one or more times even though it could be a different area of practice. This indicated that professional experience rather than technical skills is the key (Hodgetts et al. 2007).

The opportunity to further education was seen as an important factor for job satisfaction among occupational therapist (Mccombie & Antanavage 2017; Tariah et al. 2011). However, this finding contraindicates studies in which extrinsic factor such as the opportunity to further education was discovered as inferior to intrinsic factors such as personal development, feeling valued as an employee and diversity of practice when it comes to job satisfaction. Diversity of practice for job satisfaction is supported by Scanlan and Still (2013), whereby occupational therapist working in mental health highlighted cognitive demands as higher job satisfaction along with receiving rewards and recognition. Tariah et al. (2011) also found that job satisfaction is associated with case varieties.

It has been reported that job satisfaction was related to providing an effective clinical care while job dissatisfaction was related to poor profile and status of profession (Moore et al. 2006). Relationship with colleague, team members, other health team members (Tariah et al. (2011) and non-occupational therapy workers (Mccombie & Antanavage 2017) were also identified as factors influencing job satisfaction. Other factors associated with job satisfaction are opportunity to exercise passion working with people, therapeutic relationship with clients and their family, improvement in clients' condition, and gaining new skills and knowledge (Tariah et al. 2011). Job satisfaction was further associated with good mentorship, clinical skills, realistic caseload, opportunity to further education, and developing interdisciplinary relationship with non-occupational therapy workers (Mccombie & Antanavage 2017). Occupational therapists appeared to experience the highest level of satisfaction with the nature of their work, operating conditions and working with co-workers, whilst pay or salary was a major source of job dissatisfaction (Sewpersadh et al. 2016).

In conclusion, a longer duration of study on the clinical placement, work readiness and job satisfaction of undergraduates may give better

preparation for work readiness with many factors contributing for job satisfaction.

### STUDY LIMITATION

Quantitative and qualitative studies published on work readiness and job satisfaction were limited in detail. In this article, work readiness and job satisfaction were identified as important components during the transition from an occupational therapy student to an occupational therapist at work. Research from other countries such as, New Zealand, Australia and Jordanian dominated this literature but these countries have very different findings. Further research on work readiness and job satisfaction of occupational therapist can contribute to promoting the welfare of occupational therapists as well as the quality of service delivered.

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### REFERENCES

- Aiken, L. H., Sermeus, W., Van Den Heede, K., Sloane, D. M., Busse, R., Mckee, M., Bruyneel, L., Rafferty, A. M., Griffiths, P. & Moreno-Casbas, M. T. 2012. Patient safety, satisfaction, and quality of hospital care: Cross sectional surveys of nurses and patients in 12 countries in Europe and the United States. *BMJ* 344: e1717.
- Barnitt, R. & Salmond, R. 2000. Fitness for purpose of occupational therapy graduates: Two different perspectives. *British Journal of Occupational Therapy* 63(9): 443-448.
- Billett, S. 2009. Realising the educational worth of integrating work experiences in higher education. *Studies in Higher Education* 34(7): 827-843.
- Brockwell, D., Wielandt, T. & Clark, M. 2009. Four years after graduation: Occupational therapists' work destinations and perceptions of preparedness for practice. *Australian Journal of Rural Health* 17(2): 71-76.
- Caballero, C. L., Walker, A. & Fuller-Tyszkiewicz, M. 2011. The work readiness scale (Wrs): Developing a measure to assess work readiness in college graduates. *Journal of Teaching and Learning for Graduate Employability* 2(2): 41-54.
- Cheong, K.-C., Hill, C., Fernandez-Chung, R. & Leong, Y.-C. 2016. Employing the

- 'unemployable': Employer perceptions of Malaysian graduates. *Studies in Higher Education* 41(12): 2253-2270.
- Doherty, G., Stagnitti, K. & Schoo, A. M. 2009. From student to therapist: Follow up of a first cohort of bachelor of occupational therapy students. *Australian Occupational Therapy Journal* 56(5): 341-349.
- Graham, C. & Mckenzie, A. 1995. Delivering the promise: The transition from higher education to work. *Education and Training* 37(1): 4-11.
- Gray, M., Clark, M., Penman, M., Smith, J., Bell, J., Thomas, Y. & Trevan-Hawke, J. 2012. New graduate occupational therapists feelings of preparedness for practice in Australia and a Otearoa/New Zealand. *Australian Occupational Therapy Journal* 59(6): 445-455.
- Harvey, L. 2005. Embedding and integrating employability. *New Directions for Institutional Research* 2005(128): 13-28.
- Hayes, L. J., O'Brien-Pallas, L., Duffield, C., Shamian, J., Buchan, J., Hughes, F., Laschinger, H. K. S., North, N. & Stone, P. W. 2006. Nurse turnover: A literature review. *International journal of nursing studies* 43(2): 237-263.
- Hodgetts, S., Hollis, V., Triska, O., Dennis, S., Madill, H. & Taylor, E. 2007. Occupational therapy students' and graduates' satisfaction with professional education and preparedness for practice. *Canadian Journal of Occupational Therapy* 74(3): 148-160.
- Ismail, R., Yussof, I. & Sieng, L. W. 2011. Employers' perceptions on graduates in Malaysian services sector. *International Business Management* 5(3): 184-193.
- Lee, S. & Mackenzie, L. 2003. Starting out in rural New South Wales: The experiences of new graduate occupational therapists. *Australian Journal of Rural Health* 11(1): 36-43.
- Litchfield, A., Frawley, J. & Nettleton, S. 2010. Contextualising and integrating into the curriculum the learning and teaching of work-ready professional graduate attributes. *Higher Education Research & Development* 29(5): 519-534.
- Mccombie, R. P. & Antanavage, M. E. 2017. Transitioning from occupational therapy student to practicing occupational therapist: First year of employment. *Occupational Therapy in Health Care* 31(2): 126-142.
- Moore, K., Cruickshank, M. & Haas, M. 2006. Job satisfaction in occupational therapy: A qualitative investigation in urban Australia. *Australian Occupational Therapy Journal* 53(1): 18-26.
- National Education Statistics : Higher Education Sector. 2017. <https://eduadvisor.my/articles/what-didnt-know-fresh-graduate-unemployment-malaysia-infographic/>
- Omar, C. & Rajoo, S. 2016. Unemployment among graduates in Malaysia. *International Journal of Economics, Commerce and Management* 4(8): 367-374.
- Painter, J., Akroyd, D., Wilson, S. & Figuers, C. 1995. The predictive value of selected job rewards on occupational therapists' job satisfaction in ambulatory care settings. *Occupational Therapy in Health Care* 9(4): 21-37.
- Robertson, L. J. & Griffiths, S. 2009. Graduates' reflections on their preparation for practice. *British Journal of Occupational Therapy* 72(3): 125-132.
- Scanlan, J. N. & Still, M. 2013. Job satisfaction, burnout and turnover intention in occupational therapists working in mental health. *Australian Occupational Therapy Journal* 60(5): 310-318.
- Sewpersadh, U., Lingah, T. & Govender, P. 2016. Job satisfaction among occupational therapists. *South African Journal of Occupational Therapy* 46(1): 6-8.
- Spencer, L., Ritchie, J., Lewis, J. & Dillon, L. 2003. Quality in qualitative evaluation: a framework for assessing research evidence.
- Stokes, H. & Wyn, J. 2007. Constructing identities and making careers: young people's perspectives on work and learning. *International Journal of Lifelong Education* 26(5): 495-511.
- Tariah, H. S. A., Hamed, R. T., Alheresh, R. A., Abu-Dahab, S. M. & Al-Oraibi, S. 2011. Factors influencing job satisfaction among Jordanian occupational therapists: A qualitative study. *Australian Occupational Therapy Journal* 58(6): 405-411.
- Tryssenaar, J. & Perkins, J. 2001. From student to therapist: exploring the first year of practice. *American Journal of Occupational Therapy* 55(1): 19-27.
- Vandenbos, G. R. 2007. *Apa Dictionary of Psychology*. American Psychological Association.
- Weiss, H. M. 2002. Deconstructing job satisfaction: Separating evaluations, beliefs and affective experiences. *Human Resource Management Review* 12(2): 173-194.

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## Pemencilan *Acanthamoeba* daripada Konjunktiva Pengguna Kanta Sentuh

(Isolation of *Acanthamoeba* sp. from Conjunctiva of Contact Lens Users)

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### ABSTRAK

*Acanthamoeba* sp. adalah ameba hidup bebas yang menyebabkan jangkitan mata yang boleh membawa kepada kebutaan. Kajian *Acanthamoeba* sp. yang dilakukan di Malaysia lebih tertumpu kepada pemencilan organisma ini di persekitaran dan daripada pesakit keratitis. Kajian ini dilakukan untuk mengkaji dan memahami samada *Acanthamoeba* sp. mudah dipencil dan merupakan sebahagian daripada flora normal pada mata manusia. Seramai 30 individu normal yang terdiri daripada pelajar Universiti Kebangsaan Malaysia yang memakai kanta sentuh telah mengambil bahagian secara sukarela dalam kajian ini. Sampel diambil dengan melakukan swab pada bahagian bawah konjunktiva setiap subjek menggunakan swab kapas yang steril. Kesemua sampel dikulturkan mengikut tatacara piawai dan diinokulasikan ke atas plat agar bukan nutrien yang telah dititiskan dengan *Escherichia coli* matian haba. Plat agar kemudian dieram pada suhu 30°C dan diperiksa setiap hari selama 14 hari di bawah mikroskop kebalikan untuk mengesan sebarang kehadiran trofozoit atau sista *Acanthamoeba* sp. Daripada 30 sampel swab konjunktiva yang diambil, kesemuanya menunjukkan hasil yang negatif untuk kehadiran *Acanthamoeba* sp. Ini menunjukkan bahawa *Acanthamoeba* sp. tidak mudah dipencil dan kemungkinan besar bukan menjadi sebahagian daripada flora normal konjunktiva individu sihat.

Kata kunci : Pemencilan; *Acanthamoeba*; Swab konjunktiva; Malaysia

### ABSTRACT

*Acanthamoeba* sp. is a free living amoeba which can cause infection of the eye leading to blindness. Studies on *Acanthamoeba* in Malaysia mainly focus on isolating this organism from the environment as well as from keratitis cases. This study is undertaken to unravel as to whether *Acanthamoeba* is easy to isolate or be part of the normal flora of the human eye. A total of 30 normal individuals comprising UKM students wearing contact lenses participated in this study voluntarily. The samples were taken by swabbing the lower part of conjunctiva using sterile swabs. All samples were cultured using standard method and inoculated on non-nutrient agar plates overlaid with *Escherichia coli*. The plates were incubated at 30°C and examined daily using inverted microscope for 14 days for the presence of trophozoites or cysts of *Acanthamoeba* sp. None of the 30 conjunctival swabs taken was positive for *Acanthamoeba*. This signifies that *Acanthamoeba* sp. is not easily isolated and most probably is not part of the normal conjunctival flora of healthy individuals.

Key words: Isolation; *Acanthamoeba*; Conjunctival swab; Malaysia.

### PENGENALAN

*Acanthamoeba* sp. adalah ameba hidup bebas dan tergolong dalam famili Acanthamoebidae. *Acanthamoeba* sp. boleh ditemui di persekitaran seperti di udara (Kingston & Warhurst 1969), tanah, pasir, debu, air tasik

dan air laut. Manakala daripada manusia, *Acanthamoeba* sp. boleh dipencilkan daripada hidung (Lawande et al. 1979) dan tekak (Wang & Feldman 1967) bagi individu normal dan kornea bagi pesakit keratitis (Mohamed Kamel & Norazah 1995; Nagington et al. 1974), cecair serebrospina pesakit meningoensefalitis



dan dari lesi kulit pesakit terimunokompromi (Slater et al. 1994).

*Acanthamoeba* sp. penting dari segi perubatan kerana ia boleh menginfeksi sistem saraf pusat, kulit dan mata. Infeksi yang paling kerap disebabkan oleh *Acanthamoeba* sp. ialah infeksi pada kornea yang boleh menyebabkan kebutaan pada individu normal yang sihat. Keratitis *Acanthamoeba* ini berlaku apabila terdapat trauma pada kornea dan membolehkan invasi *Acanthamoeba* sp. ke dalam stroma mata. Kebanyakan kes keratitis *Acanthamoeba* bermula dengan kecederaan pada kornea dan berkaitan dengan penggunaan kanta sentuh (Moore et al. 1985). Penggunaan kanta sentuh adalah faktor risiko terpenting dalam kejadian kes keratitis *Acanthamoeba*.

Kes keratitis *Acanthamoeba* pertama kali dilaporkan pada 1973 di United Kingdom dan bilangan kes terus meningkat sejajar dengan peningkatan penggunaan kanta sentuh. Di Malaysia, kes keratitis pertama melibatkan infeksi oleh *Acanthamoeba* sp. yang berlaku pada seorang wanita yang mempunyai sejarah menggunakan kanta sentuh dalam tempoh yang lama (Mohamed Kamel & Norazah 1995). Bilangan kes terus meningkat di Malaysia, walaupun kebanyakannya tidak dilaporkan (Mohamed Kamel et al. 2005).

Setakat ini, kajian *Acanthamoeba* sp. yang dilakukan di Malaysia lebih tertumpu kepada pemencilan organisma ini daripada persekitaran dan beberapa laporan pemencilan *Acanthamoeba* sp. daripada pesakit keratitis. Kajian ini dilakukan untuk mengkaji dan memahami samada *Acanthamoeba* sp. mudah dipencilkan dan merupakan sebahagian daripada flora normal pada mata manusia. Kajian ini melibatkan individu normal yang memakai kanta sentuh yang menjadi faktor risiko utama untuk penyakit keratitis *Acanthamoeba*.

## BAHAN DAN KAEDAH

Sebanyak 30 sampel swab konjunktiva individu normal, telah diambil secara sukarela

daripada pelajar Universiti Kebangsaan Malaysia yang memakai kanta sentuh. Sampel diambil dengan melakukan swab pada bahagian bawah konjunktiva subjek menggunakan swab yang steril. Sampel kemudian dimasukkan ke dalam botol universal yang mengandungi 10 ml larutan salin Page sebagai media pengangkut. Sampel divorteks selama tiga minit untuk memastikan kesemua organisma termasuk *Acanthamoeba* sp. tertanggal daripada swab dan permukaan dinding botol universal. Sampel yang telah di vorteks kemudian dituras melalui membran turas bersaiz liang 0.45  $\mu\text{m}$  menggunakan pam vakum (Gradus et al. 1989).

Setelah proses penurasan selesai, membran turas yang mengandungi sedimen sampel akan dipindahkan secara terbalik ke atas permukaan agar bukan nutrien yang telah dititiskan dengan suspensi *E. coli* matian haba. Seterusnya, plat dieram pada suhu 30°C dan selepas 3 hari pengeraman, sampel diperiksa untuk kehadiran trofozoit atau sista *Acanthamoeba* di bawah mikroskop kebalikan selama 14 hari sebelum disahkan negatif.

Bagi pengecaman kumpulan *Acanthamoeba*, kriteria Page (1967) digunakan semasa mengamati peringkat sista dengan menggunakan program Image Analysis Software Video-Test 4.0. Saiz dan morfologi dinding sista iaitu endosista dan ektozystanya dapat memberi gambaran mengenai kumpulan *Acanthamoeba* samada kumpulan I (astronyxids), kumpulan II (polyphagids) atau kumpulan III (culbertsonids).

## HASIL

Seramai 30 orang peserta mengambil bahagian dalam kajian ini dan mereka kesemuanya adalah pelajar UKM yang menggunakan kanta sentuh. Kesemua sampel swab konjunktiva yang dikulturkan menunjukkan hasil yang negatif untuk kehadiran *Acanthamoeba* sp. (Jadual 1).

JADUAL 1. Hasil pemencilan *Acanthamoeba* sp. dari swab konjunktiva individu normal

Jenis sampel	Bil. Sampel (N)	Bil positif (n)	Peratus pemencilan
Pengguna kanta sentuh	30	0	0

### PERBINCANGAN

Kehadiran *Acanthamoeba* sp. secara meluas telah membawa kepada kajian ini untuk memencilkan *Acanthamoeba* sp. daripada swab konjunktiva individu normal. Di Malaysia kajian pemencilan *Acanthamoeba* sp. daripada pelbagai persekitaran pernah dilakukan (Mohamed Kamel et al. 2017, 2108a, 2018c, 2018d). Pemencilan daripada manusia khususnya dari kalangan pesakit keratitis *Acanthamoeba* sp. juga telah dilakukan (Mohamed Kamel et al. 2018e). Pemencilan daripada swab nasal juga pernah dilakukan dengan peratusan positif sebanyak 5.6% (Mohamed Kamel et al. 2018b)

Pemencilan *Acanthamoeba* daripada konjunktiva individu normal telah dijalankan oleh Khoo 1999 dalam kalangan 141 orang pelajar perubatan di UKM. Kesemua sampel tersebut gagal memencilkan *Acanthamoeba*. Anisah et al. 2005, telah mengkaji kemungkinan kewujudan *Acanthamoeba* pada mata individu sihat yang terdiri daripada 286 orang kanak-kanak Orang Asli di Perak dengan menggunakan swab konjunktiva. Pilihan subjek ini adalah berdasarkan anggapan bahawa kanak-kanak Orang Asli adalah sangat terdedah kepada pelbagai jenis persekitaran yang mungkin tercemar dengan *Acanthamoeba* khususnya persekitaran akuatik seperti sungai dan tasik. Bagaimanapun hasil keputusan tersebut gagal menemui sebarang pemencilan *Acanthamoeba* daripada konjunktiva. Berbeza dengan kedua-dua kajian lepas (Khoo 1999 dan Anisah et al.

2005), yang mana subjek terdiri daripada individu normal yang tidak memakai kanta sentuh, kajian ini memilih individu yang memakai kanta sentuh. Ini adalah berdasarkan kepada fakta bahawa faktor risiko utama penyakit keratitis *Acanthamoeba* adalah menggunakan kanta sentuh dan lebih daripada 80% kes keratitis *Acanthamoeba* adalah pengguna kanta sentuh (Mutalib et al. 2005). Besar kemungkinan kanta sentuh yang telah terkontaminasi, boleh memindahkan *Acanthamoeba* secara terus kepada mata apabila ia digunakan. Bagaimanapun, kajian ini juga turut memberikan hasil yang negatif untuk sebarang pemencilan *Acanthamoeba* sp. Hasil kajian yang negatif memberikan dua kemungkinan samada *Acanthamoeba* sp. memang tiada pada mata individu normal atau kaedah swab konjunktiva kurang sensitif untuk pemencilan *Acanthamoeba* sp.

### RUJUKAN

- Anisah N, Amal H, Kamel AG, Yusof S, Noraina AR, Norhayati M. 2005. Isolation of *Acanthamoeba* sp. from conjunctival sac of healthy individuals using swab. *Tropical Biomedicine* 22:1;11-14.
- Gradus, M.S., Koenig S.B., Hyndiuk, R.A. & Decarlo, J. 1989. Filter culture technique using amoeba saline transport medium for the non-invasive diagnosis of *Acanthamoeba* keratitis. *American Journal of Clinical Pathology* 92:682-685.
- Khoo EL. 1999. Isolation of *Acanthamoeba* from healthy human conjunctival sac. Tesis Sarjana. Universiti Kebangsaan Malaysia.

- Kingston, D. & Warhurst, D.C. 1969. Isolation of amoeba from the air. *Journal of Medical Microbiology* 2:25-27.
- Lawande, R.V., Abraham, S.N., John, I. & Egler, L.J. 1979. Recovery of amoebas from the nasal passages of children during the dusty hartmattan period in Zaria. *American Journal of Clinical Pathology* 71:201-203.
- Mohamed Kamel, A.G. & Norazah, A. 1995. First case of *Acanthamoeba* keratitis in Malaysia. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 89:652.
- Mohamed Kamel AG, Haniza Hamzah, Anisah Nordin, Yusof Suboh, Faridah Hanum, Norhayati Moktar & Norazah Ahmad. 2005. More *Acanthamoeba* keratitis cases in Malaysia. *International Medical Journal* 12;1:7-9.
- Mohamed Kamel AG, Nurulhuda S, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2017. Isolation of *Acanthamoeba* spp. from domestic water taps. *Buletin FSK* 1(1): 89-94.
- Mohamed Kamel AG, Mohd Hasrul H, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2018a. Isolation of *Acanthamoeba* sp. from the Air. *Buletin FSK* 2(2)(2018): 8-11.
- Mohamed Kamel AG, Andry Dauni, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2018b. Isolation of *Acanthamoeba* sp. from Nasal Swabs of Normal Individual. *Buletin FSK* 2(1): 45-50.
- Mohamed Kamel AG, Nurulhuda Sharif, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2018c. Isolation of *Acanthamoeba* sp. from Aquatic Environment. *Buletin FSK* 2(1): 5-10.
- Mohamed Kamel AG, Mimi Fazah, Anisah Nordin, Yusof Suboh, Noraina AR & Norazah Ahmad. 2018d. Isolation of *Acanthamoeba* spp. from Soil Environment. *Buletin FSK* 2(1): 63-68.
- Mohamed Kamel AG, Irdawati Azhar, Haliza Abdul Mutalib, Anisah Nordin, Yusof Suboh, Noraina Ab Rahim & Norazah Ahmad. 2018e. *Acanthamoeba* Keratitis in Malaysia. *Sains Malaysiana* 47(7): 1563-1569
- Moore, M.B., McCulley, J.P., Luckenbach, M., Gelender, H., Newton, C., McDonald, M. B. & Visvesvara, G.S. 1985. *Acanthamoeba* Keratitis Associated with soft contact lens. *American Journal of Ophthalmology* 100:396-403
- Mutalib Haliza, Saleha AM, Mohamed Kamel AG, Anisah N & Yusof S & Norhayati M (2005). Punca Infeksi *Acanthamoeba* spp di kalangan pemakai kanta sentuh di Kuala Lumpur. *Malaysian J. Health Sciences* 3:2; 9-17
- Nagington, J., Watson, P.G., Palyfair, T.J., Jones, B.R. & Steela, A. 1974. Amoebic infection of the eyes. *Lancet* 2:1537-1540.
- Page, F.C. 1967. Re-definition of the genus *Acanthamoeba* with descriptions of three species. *Journal of Protozoology* 14:709-724.
- Slater, C.A., Sickel, J.Z., Visvesvara, G.S., Pabico, R.C. & Gaspari A.A. Brief report: Successful treatment of disseminated *Acanthamoeba* infection in an immunocompromised patient. *The New England Journal of Medicine* 331(2):85-87.
- Wang, S.S. & Feldman, H.A. 1967. Isolation of *Hartmanella* species from human throats. *The New England Journal of Medicine* 22:1174-1179.

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# **Sikap dan Amalan Terhadap Penggunaan Statistik Perubatan Dalam Kalangan Ahli Terapi Carakerja Kuala Lumpur**

(Attitude and Practice Towards the Utilization of Medical Statistics Among Occupational Therapists in Kuala Lumpur)

HANIF FARHAN MOHD RASDI\* & KUA JEE MIN

## **ABSTRAK**

Statistik perubatan adalah merupakan satu subjek penting dalam semua jurusan perubatan dan sains kesihatan, termasuklah terapi carakerja. Walaubagaimanapun, sehingga kini, sejauh mana penggunaan statistik perubatan dalam amalan terapi carakerja di Malaysia masih tidak diketahui. Oleh yang demikian, kajian ini bertujuan untuk mengenalpasti sejauh mana sikap dan amalan ahli terapi carakerja terhadap penggunaan statistik perubatan dalam amalan klinikal. Seramai 106 orang ahli terapi carakerja yang bekerja di sekitar Kuala Lumpur telah mengambil bahagian dalam kajian keratan rentas ini menggunakan kaedah persampelan bertujuan. Kadar respon bagi kajian ini adalah sebanyak 70.6%. Borang soal selidik sikap dan amalan terhadap penggunaan statistik perubatan telah dibina oleh penyelidik yang mengandungi 20 soalan sikap dan 15 soalan amalan. Secara umumnya, responden menunjukkan sikap yang positif terhadap statistik perubatan ( $51.18 \pm 6.69$ ). Walaubagaimanapun, tahap amalan statistik perubatan dalam kalangan ahli terapi carakerja secara umumnya masih berada pada tahap yang minima ( $33.53 \pm 10.17$ ). Berdasarkan korelasi Pearson, terdapat hubungan positif yang signifikan antara sikap dan amalan ahli terapi carakerja terhadap statistik perubatan ( $r = 0.33, p = 0.001$ ). Sebilangan besar ahli terapi carakerja di Kuala Lumpur mempunyai sikap yang positif terhadap statistik perubatan. Bagi meningkatkan lagi penggunaan statistik perubatan dalam amalan klinikal, kajian lanjutan bagi mengenalpasti strategi untuk meningkatkan penggunaan statistik perubatan adalah sangat digalakkan.

Kata kunci: biostatistik; amalan berteraskan bukti; rehabilitasi

## **ABSTRACT**

Medical statistics is a compulsory subject for all medical and health sciences, including occupational therapy. However, to date, the utilization of medical statistics in occupational therapy clinical practice in Malaysia is still unknown. Therefore, this study aimed to assess the attitude and practice of using medical statistics among occupational therapists in their clinical practice. A total of 106 occupational therapists around Klang Valley participated in this cross-sectional study based on purposive sampling. The response rate for this study was 70.6%. The attitude and practice towards medical statistics questionnaires was developed by the researcher, consisting of 20 questions of attitude and 15 questions of practice. In general, the respondents show positive attitude towards medical statistics ( $51.18 \pm 6.69$ ). However, practice score is generally minimal with most of the respondents reported seldom use of medical statistics into practice ( $33.53 \pm 10.17$ ). Pearson correlation test revealed a significant positive association between attitude and practice with ( $r = 0.33, p = 0.001$ ). A substantial number of practicing occupational therapists in Klang Valley appeared to have positive attitudes towards medical statistics. In order to improve the use of medical statistics in clinical practice, future studies that investigate strategies to promote the use of medical statistics among occupational therapists is highly recommended.

Keywords: biostatistics; evidence-based practice; rehabilitation

## **PENGENALAN**

Secara umumnya, statistik perubatan merupakan komponen saintifik yang paling asas dalam penyelidikan kesihatan. Statistik perubatan sebenarnya telah diiktiraf sebagai salah satu cabang dalam bidang statistik selama 40 tahun di United Kingdom (Dodge 2006). Secara umumnya, statistik perubatan adalah merangkumi kaedah untuk merumus,

mengumpul, menyampai dan mentafsir data berkaitan perubatan, serta menggunakan maklumat yang diperolehi untuk membuat anggaran perbezaan, perkaitan dan peramalan melalui kaedah pengujian hipotesis. Dengan berkembangnya bidang statistik perubatan, ia bukan sahaja membantu dalam menyusun maklumat yang banyak secara lebih formal, malah ia juga dapat mengambil kira banyak perubahan yang wujud dalam proses biologi

(Betty & Jonathan 2003). Dalam era globalisasi ini, penyelidikan dan pembangunan (R&D) memainkan peranan yang penting dan menjadi indikator kepada kemajuan sesuatu bidang, termasuklah terapi carakerja. Penyelidikan adalah merupakan suatu kemestian, bukan sahaja dalam proses penambahbaikan sesuatu servis atau produk, malah juga penting bagi meningkatkan tahap ilmu pengetahuan berkaitan rawatan terapi carakerja dalam bidang klinikal (Waine et al. (1997). Kemajuan dalam penyelidikan dan pembangunan yang pesat merupakan salah satu faktor penyumbang kepada kemajuan ekonomi sesebuah negara (Norazida & Hasnah 2013). Tambahan pula, terdapat peningkatan dalam bilangan jurnal kepunyaan Malaysia yang mendapat liputan dalam Scopus, sebuah pangkalan data terbesar di antarabangsa. Peningkatan nyata daripada 53 tajuk pada tahun 2011 meningkat kepada 78 tajuk pada tahun 2015, antaranya 13 tajuk merupakan jurnal perubatan (Abrizah 2016). Para pengamal dalam bidang kesihatan adalah diharapkan dan seharusnya banyak membaca jurnal perubatan untuk memastikan pengetahuan diri dalam bidang kesihatan adalah seiring dengan pembangunan perubatan terkini (Wulff et al. 1987).

Penguasaan statistik perubatan yang lemah memaparkan keyakinan yang rendah dan kebolehan yang terhad untuk memahami sesebuah literasi perubatan sepenuhnya (Windish et al. 2007). Hasil kajian daripada beberapa penyelidik lain turut menyokong dapatan kajian ini (Bookstaver et al. 2012; Scheutz et al. 1988; Wulff et al. 1987). Di samping itu, melihat kepada tahap kesedaran kepentingan statistik perubatan dalam kajian-kajian yang lepas, ramai yang berpendapat bahawa pengetahuan mereka dalam bidang statistik perubatan masih terhad, dan berminat untuk menyertai latihan tambahan sekiranya disediakan (Khaliq et al. 2012). Namun, ada juga responden yang berpendapat statistik perubatan kurang berkaitan dengan amalan kerja seharian (Mehrdad et al. 2008). Peningkatan kualiti dalam penggunaan kaedah statistik perubatan dalam kajian adalah jelas dan nyata (Abrizah 2016), tetapi pemahaman para pembaca, khususnya dalam kalangan pegawai perubatan, doktor pergigian, jururawat, dan pegawai farmasi terhadap analisis statistik adalah masih terhad. Kenyataan ini turut disokong oleh beberapa hasil kajian lepas dari luar negara (Bookstaver et al. 2012; Scheutz et al. 1988;

Wulff et al. 1987). Walaubagaimanapun, kajian-kajian seumpama ini masih baru di Malaysia.

Sebahagian besar kaedah diagnosis dan terapeutik adalah berdasarkan kepada penerbitan dalam jurnal saintifik. Kesilapan mentafsir keterangan analisis statistik, sama ada oleh pengarang atau pembaca, boleh membawa kesan yang buruk dalam amalan klinikal. Sekiranya para pembaca mempunyai pemahaman asas dalam statistik perubatan, ia amat membantu dalam pentafsiran analisis kajian dan membuat justifikasi klinikal. Oleh sebab itu, kajian ini telah dilaksanakan untuk mengkaji sejauh mana sikap dan amalan ahli terapi carakerja di Malaysia terhadap penggunaan statistik perubatan.

## METODOLOGI

### Rekabentuk Kajian

Kajian yang dijalankan adalah kajian soal selidik yang berbentuk kajian keratan rentas terhadap ahli terapi carakerja yang bekerja di beberapa hospital kerajaan dan swasta sekitar Kuala Lumpur. Kriteria inklusi kajian ini meliputi ahli terapi carakerja yang mempunyai pengalaman kerja melebihi satu tahun, warganegara Malaysia, mendapat pendidikan formal dalam bidang terapi carakerja di institusi pengajian awam atau swasta di Malaysia serta menjalankan khidmat klinikal sebagai tugas hakiki.

### Persampelan

Seramai 106 orang ahli terapi carakerja telah dipilih menggunakan persampelan bertujuan. Saiz sampel yang dipilih ini berpadanan dengan saiz populasi kajian menurut pengiraan penentuan saiz sampel yang dicadangkan oleh Krejcie dan Morgan (1970), dengan selang keyakinan 95% dan tahap anggaran ketepatan 5%. Saiz sampel populasi yang ada adalah 150 orang. Dengan mengambil kira 10% keciciran responden, kami akan mendapatkan sampel seramai 106 orang.

### Prosedur Kajian

Sebelum memulakan kajian, penyelidik telah mendapatkan kelulusan etika penyelidikan daripada pihak Sekretariat Penyelidikan dan Inovasi UKM (NN-2016-072) dan Jawatankuasa Etika Penyelidikan Perubatan KKM (NMRR-17-150-34091). Kemudian, saringan telah dijalankan untuk mendapatkan subjek yang memenuhi kriteria inklusi. Dengan persetujuan daripada subjek, penerangan yang lebih lanjut mengenai

tujuan dan perjalanan kajian telah diberikan dengan mengagihkan borang maklumat kajian dan pengisian borang persetujuan secara manual. Selepas memperolehi persetujuan daripada responden, borang soal selidik diedarkan. Responden dikehendaki untuk menjawab borang soal selidik yang terdiri daripada tiga bahagian, iaitu data demografik, sikap dan amalan terhadap statistik perubatan. Hasil keputusan kemudiannya disemak selepas borang soal selidik dipulangkan kepada pihak penyelidik dalam tempoh dua minggu.

### **Instrumen Kajian**

Borang soal selidik kajian ini dibangunkan oleh pihak penyelidik untuk kajian ini. Soalan-soalan juga disesuaikan mengikut konteks tempat kerja di Malaysia serta pembelajaran dan pengajaran kursus statistik perubatan dalam bidang terapi carakerja di peringkat kolej atau universiti. Borang soal selidik ini terdiri daripada tiga bahagian: a) Ciri-ciri sosiodemografik responden, b) Soal selidik sikap terhadap penggunaan statistik perubatan dan c) Soal selidik amalan penggunaan statistik perubatan.

Kesahan muka diperoleh melalui 10 orang ahli terapi carakerja yang sedang berkhidmat di Hospital Seremban. Kesahan kandungan pula diperoleh melalui semakan borang soal selidik oleh dua orang pensyarah UKM yang mengajar kursus statistik perubatan. Pengubahsuaian yang sewajarnya telah dibuat berdasarkan kepada komen penambahbaikan daripada pakar-pakar yang terlibat.

### **Analisis Statistik**

Data yang diperolehi telah dianalisa menggunakan perisian IBM SPSS Statistics versi 25. Nilai kebolehppercayaan konsistensi dalaman dinilai menggunakan nilai alfa Cronbach. Setelah data diperolehi, nilai purata, sisihan piawai dan taburan data bagi tahap sikap dan amalan penggunaan statistik perubatan dinilai menggunakan analisis deskriptif. Bagi mengenalpasti sejauh manakah hubungan antara sikap dan amalan statistik perubatan dalam bidang klinikal ahli terapi carakerja, analisis inferensi korelasi Pearson digunakan kerana taburan data adalah normal.

## **HASIL KAJIAN**

### **Ciri-Ciri Sosiodemografi Responden**

Pada peringkat awal, kajian ini telah mendapat respon daripada 113 orang responden.

Walaupun bagaimanapun, tujuh orang daripada jumlah ini telah dikecualikan kerana tidak melengkapi borang soal selidik. Jumlah data yang lengkap adalah 106 secara keseluruhannya dengan kadar respon sebanyak 70.6%.

Analisis deskriptif telah dijalankan untuk menunjukkan taburan data demografik 106 responden (Jadual 1). Daripada jumlah itu, 46 (43.4%) orang adalah wanita, manakala 60 (56.6%) orang adalah lelaki. Majoriti responden iaitu 76 (71.7%) orang mempunyai kelulusan diploma dalam bidang terapi carakerja dan berkhidmat sebagai jurupulih carakerja, manakala 30 (28.3%) orang mempunyai kelulusan ijazah sarjana muda dan ke atas, dan berkhidmat sebagai pegawai pemulihan carakerja.

### **Konsistensi Dalaman Dan Analisis Deskriptif Soal Selidik**

Konsistensi dalaman telah diukur bertujuan untuk menentukan nilai kebolehppercayaan bagi soal selidik sikap dan amalan terhadap penggunaan statistik perubatan ( $N=106$ ). Bahagian sikap memperoleh nilai Alfa Cronbach sebanyak 0.80, menunjukkan ia mempunyai konsistensi dalaman yang tinggi. Bahagian amalan memperoleh nilai Alfa Cronbach sebanyak 0.941, menunjukkan ia mempunyai konsistensi dalaman yang tinggi. Secara umumnya, responden menunjukkan sikap yang positif terhadap statistik perubatan pada setiap soalan yang berkaitan. Walaupun bagaimanapun, tahap amalan statistik perubatan dalam kalangan ahli terapi carakerja masih berada pada tahap yang minima. Jumlah skor soalan sikap adalah 80. Purata skor sikap responden adalah  $51.18 \pm 6.69$ , dengan skor minimum 36 dan skor maksimum 67. Jumlah skor soalan amalan adalah 60. Purata skor amalan responden adalah  $33.54 \pm 10.17$ , dengan skor minimum 15 dan skor maksimum 60 (Jadual 2).

### **Hubungkait Di Antara Sikap Dan Amalan Terhadap Penggunaan Statistik Perubatan**

Ujian korelasi Pearson telah dijalankan untuk mengkaji hubungkait antara sikap dan amalan para responden terhadap statistik perubatan. Berdasarkan kepada Jadual 3 yang menunjukkan nilai korelasi koefisien Pearson  $r=0.331$  ( $p=0.001$ ), kajian ini mendapati bahawa terdapat korelasi linear positif dan signifikan antara sikap dan amalan dalam penggunaan statistik perubatan (Jadual 3).

JADUAL 1. Taburan data demografik responden

	Frekuensi (n)	Peratus (%)
<b>Jantina</b>		
Perempuan	46	43.4
Lelaki	60	56.6
<b>Umur</b>		
20-30	76	71.7
≥31	30	28.3
<b>Jawatan di tempat kerja</b>		
U29	66	62.3
U32	13	12.3
U36	6	5.7
U40	2	1.9
U41	18	17.0
U44	1	0.9
<b>Tahun pengalaman klinikal</b>		
0-6	69	65.1
≥7	37	34.9
<b>Pengajian tahap tertinggi</b>		
Diploma	76	71.7
Ijazah sarjana muda ke atas	30	28.3

JADUAL 2. Analisis deskriptif dan konsistensi dalaman soal selidik sikap dan amalan terhadap penggunaan statistik perubatan

Parameter	Min	Sisihan Piawai	Kepencongan	Ralat piawai kepengongan	Alfa Cronbach
Sikap	51.18	6.694	0.206	0.235	0.803
Amalan	33.53	10.17	-0.085	0.235	0.941

JADUAL 3. Hubungkait antara jumlah skor sikap dan jumlah skor amalan

Parameter	Ujian	Sikap	Amalan
Sikap	Korelasi Pearson	1	0.331**
	Sig. (2 hujung)	-	0.001
Amalan	Korelasi Pearson	0.331**	1
	Sig. (2 hujung)	0.001	-

\*\* Korelasi signifikan pada tahap  $p < 0.01$  (2 hujung).

## PERBINCANGAN

### Sikap Ahli Terapi Carakerja Terhadap Penggunaan Statistik Perubatan

Majoriti responden mempunyai sikap yang agak positif terhadap statistik perubatan. Semakin

tinggi skor dalam bahagian ini menunjukkan sikap seseorang yang semakin positif terhadap statistik perubatan. Antara 106 responden dalam kajian ini, 88% responden bersetuju dan mengiktiraf kepentingan penggunaan statistik dalam bidang klinikal masing-masing. Sebanyak



80% responden turut menyokong bahawa pemahaman dalam statistik perubatan boleh membimbing seseorang ahli terapi carakerja dalam membuat keputusan klinikal. Selaras dengan hasil kajian-kajian lepas, rata-rata responden dari pelbagai latar belakang kesihatan, termasuk farmasi, jururawat, doktor dan doktor pergigian memandang positif dan merasakan adalah penting untuk memahami konsep statistik untuk menjadi pembaca celik kesusasteraan perubatan.

Walaupun tidak digariskan dalam objektif kajian ini, penelitian harus juga dilakukan terhadap faktor-faktor yang mempengaruhi sikap seseorang terhadap statistik perubatan. Pada pandangan penyelidik, faktor-faktor dalaman seperti minat terhadap perangkaan, keinginan untuk menambah baik kemahiran yang sedia ada, keinginan sokongan rakan sekerja, serta tahap motivasi untuk belajar statistik selepas menceburi bidang pekerjaan akan mempengaruhi sikap seseorang. Satu kajian yang melibatkan jururawat di Iran telah menggariskan tiga cabang tema utama yang mempengaruhi pandangan dan penggunaan statistik dalam perkhidmatan (Mehrdad et al. 2008). Pertamanya, faktor persendirian. Penggunaan statistik dalam perkhidmatan dipengaruhi oleh nilai, sikap, pengetahuan dan kemahiran yang sedia ada dalam diri seseorang. Kedua, kepercayaan sejagat. Untuk merealisasikan amalan berasaskan penyelidikan, penyelidikan haruslah bersepadu dengan segala sistem, ideologi, kaedah rawatan dan persefahaman terlebih dahulu. Ketiga, komitmen seseorang. Komitmen ini termasuklah sikap yang positif dan kesediaan seseorang untuk mengikuti perkembangan semasa.

#### **Amalan Ahli Terapi Carakerja Dalam Statistik Perubatan**

Majoriti responden mempunyai amalan yang sederhana dalam statistik perubatan. Apabila diteliti, seramai 51% responden mengatakan mereka jarang membaca sekurang-kurangnya satu jurnal artikel setiap bulan. Seramai 61% responden mengatakan mereka tidak dapat memahami istilah statistik yang biasa didapati dalam artikel jurnal seperti sisihan piawai, nilai  $p$ , dan selang keyakinan. Hanya 16% responden mempunyai amalan atau penglibatan yang kerap dan konsisten dalam menggunakan statistik perubatan dalam bidang klinikal. Hasil kajian Waine et al. (1997) merumuskan kebanyakan ahli terapi carakerja di Alberta menghabiskan

kira-kira 1.5 jam seminggu membaca jurnal. Mengambil contoh daripada profesion lain, Khaliq et al. (2012) mendapati sebanyak 52.9% doktor perubatan membaca kurang daripada 5 artikel seminggu dan Khan et al. (2009) mendapati bahawa hanya 47.1% pegawai perubatan yang berminat dalam penyelidikan perubatan.

Beberapa faktor luaran dilihat boleh mempengaruhi amalan ahli terapi carakerja terhadap statistik perubatan dalam konteks negara Malaysia. Faktor pertama ialah limitasi dalam penglibatan penyelidikan di tempat kerja. Faktor kedua ialah kurangnya penubuhan kelab jurnal dan perbincangan kajian kes berbentuk jurnal artikel di unit masing-masing. Faktor ketiga ialah keserasian kurikulum dan pengajaran statistik di universiti atau kolej dengan keperluan persendirian mahupun keperluan klinikal masa kini. Kenyataan ini turut disokong oleh beberapa kajian di luar negara (Fielding et al. 2015; Herman et al. 2007; Khaliq et al. 2012; Khan et al. 2009; Mehrdad et al. 2008; Waine et al. 1997). Hasil kajian ini mencadangkan dan menekankan keperluan penambahbaikan latihan dan pengajaran statistik perubatan yang sedia ada di peringkat kolej, universiti, mahupun tempat kerja.

#### **Hubungkait Sikap Dan Amalan Ahli Terapi Carakerja Dalam Statistik Perubatan**

Didapati bahawa terdapat korelasi positif yang bererti di antara sikap dan amalan penggunaan statistik perubatan. Dengan kata lain, semakin positif sikap seseorang, semakin tinggi amalan seseorang dalam penggunaan statistik perubatan. Ahli terapi carakerja yang mempunyai sikap lebih positif terhadap statistik perubatan berpotensi untuk menjadi lebih bersemangat untuk mencari maklumat berbentuk penyelidikan. Sikap yang positif turut memaparkan keyakinan diri seseorang terhadap kebolehan memahami dan mengkritis analisis statistik dalam jurnal artikel. Sememangnya, sikap yang baik akan mendorong seseorang mempunyai amalan yang baik dengan merujuk dan memahami lebih banyak maklumat yang dipaparkan dalam sesebuah jurnal artikel. Terdapat juga kajian yang menunjukkan penaakulan sebaliknya. Penglibatan wajib dalam kelab jurnal mingguan dalam kalangan pelatih perubatan di Karachi, Pakistan telah menunjukkan peningkatan dari segi pengetahuan dengan mengetahui perkembangan kajian semasa, kemahiran dan keyakinan dalam

penilaian kritis serta tingkah laku iaitu peningkatan tabiat bacaan jurnal (Akhund & Kadir 2006).

### **Cadangan Untuk Kajian Masa Depan**

Pada masa hadapan, kajian ini mencadangkan pengajian kesahihan konstruk menggunakan analisis faktor untuk menentukan kesahihan konstruk soal selidik sikap dan amalan soal selidik. Seterusnya, kajian ini juga boleh direplikasi menggunakan profession lain dalam bidang sains kesihatan seperti ahli fisioterapi, ahli terapi pertuturan, audiologi, optometri dan banyak lagi untuk mengetahui sikap dan amalan pengamal sains kesihatan secara menyeluruh.

### **KESIMPULAN**

Majoriti responden mempunyai amalan yang agak minima. Terdapat korelasi positif yang signifikan antara sikap dan amalan ahli terapi carakerja terhadap statistik perubatan. Langkah-langkah untuk mengintegrasikan statistik perubatan dalam amalan kerja klinikal perlulah diperhalusi dalam kajian pada masa hadapan. Untuk meningkatkan lagi penggunaan statistik perubatan dalam amalan kerja seharian, kajian lanjutan bagi mengenalpasti strategi untuk menggalakkan penggunaan statistik perubatan amatlah digalakkan untuk memastikan kelangsungan profesion dalam era globalisasi ini.

### **RUJUKAN**

- Abrizah, A. 2016. Performance of Malaysian Medical Journals. *Malaysian Journal of Medical Sciences* 23(2): 1-5.
- Akhund, S. & Kadir, M. M. 2006. Do Community Medicine Residency Trainees Learn through Journal Club? An Experience from a Developing Country. *BMC medical education* 6(1): 1.
- Betty, R. K. & Jonathan, A. 2003. *Essential Medical Statistics*. Kirkwood and Jonathan AC Sterne: Blackwell Science Ltd.
- Bookstaver, P. B., Miller, A. D., Felder, T. M., Tice, D. L., Norris, L. B. & Sutton, S. S. 2012. Assessing Pharmacy Residents' Knowledge of Biostatistics and Research Study Design. *Annals of Pharmacotherapy* 46(7-8): 991-999.
- Dodge, Y. 2006. *The Oxford Dictionary of Statistical Terms*. Oxford University Press on Demand.
- Fielding, S., Poobalan, A., Prescott, G., Marais, D. & Aucott, L. 2015. Views of Medical Students: What, When and How Do They Want Statistics Taught? *Scottish Medical Journal* 60(4): 164-169.
- Herman, A., Notzer, N., Libman, Z., Braunstein, R. & Steinberg, D. M. 2007. Statistical Education for Medical Students—Concepts Are What Remain When the Details Are Forgotten. *Statistics in Medicine* 26(23): 4344-4351.
- Khaliq, M. F., Noorani, M. M., Siddiqui, U. A. & Anwar, M. 2012. Physicians Reading and Writing Practices: A Cross-Sectional Study from Civil Hospital, Karachi, Pakistan. *BMC Medical Informatics and Decision Making* 12(1): 1-8.
- Khan, H., Khan, S. & Iqbal, A. 2009. Knowledge, Attitudes and Practices around Health Research: The Perspective of Physicians-in-Training in Pakistan. *BMC medical education* 9(1): 1.
- Krejcie, R. V. & Morgan, D. W. 1970. Determining Sample Size for Research Activities. *Educ psychol meas*
- Mehrdad, N., Salsali, M. & Kazemnejad, A. 2008. Iranian Nurses' Attitudes toward Research Utilisation. *Journal of Research in Nursing* 13(1): 53-65.
- Norazida, I. & Hasnah, A. 2013. Kepentingan Penyelidikan Dan Pembangunan (R&D) Dalam Pertumbuhan Wilayah Di Malaysia. *Prosiding PERKEM VIII, Jilid 2 (2013)* 796 - 805 ISSN: 2231-962X, hlm.
- Scheutz, F., Andersen, B. & Wulff, H. R. 1988. What Do Dentists Know About Statistics? *European Journal of Oral Sciences* 96(4): 281-287.
- Waine, M., Magill-Evans, J. & Pain, K. 1997. Alberta Occupational Therapists' Perspectives on and Participation in Research. *Canadian Journal of Occupational Therapy* 64(2): 82-88.
- Windish, D. M., Huot, S. J. & Green, M. L. 2007. Medicine Residents' Understanding of the Biostatistics and Results in the Medical Literature. *Jama* 298(9): 1010-1022.
- Wulff, H. R., Andersen, B., Brandenhoff, P. & Guttler, F. 1987. What Do Doctors Know About Statistics? *Statistics in Medicine* 6(1): 3-10.

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BULETIN SAINS KESIHATAN (BSK) ialah sebuah jurnal ilmiah berwasit yang diterbitkan dua kali setahun secara atas talian oleh Fakulti Sains Kesihatan, Universiti Kebangsaan Malaysia. Ia menerbitkan makalah dalam bidang sains kesihatan dan perubatan serta teknologi yang berkaitan. Makalah ditulis dalam bahasa Melayu atau Inggeris dan boleh berbentuk kertas asli, komunikasi pendek, laporan kes atau nota penyelidikan.

Tujuan utama jurnal ini ialah untuk menyediakan saluran bagi menerbitkan karya penyelidikan yang dijalankan dalam bidang sains kesihatan di Universiti Kebangsaan Malaysia dan mengalu-alukan sumbangan karya dari dalam dan luar negara.

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BULLETIN OF HEALTH SCIENCES (BHS) is a peer reviewed online journal published biannually by the Faculty of Health Sciences, National University of Malaysia. It publishes articles in the field of medical and health sciences and the related technology. Articles are published in Malay or English and can be written as original articles, short communications, case reports and research notes. The primary purpose of this journal is to act as a channel for the publication of research work on health sciences undertaken at Universiti Kebangsaan Malaysia and contribution of articles from within and outside the country is most welcomed.

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## **BULETIN SAINS KESIHATAN (BSK)**

### **Panduan Kepada Penyumbang**

#### **SKOP**

Buletin Sains Kesihatan (BSK) ialah sebuah jurnal ilmiah berwasit yang komited kepada perkembangan dapatan penyelidikan dalam pelbagai bidang sains kesihatan dan perubatan serta teknologi berkaitan. Ia meliputi makalah dalam pelbagai aspek sains kesihatan, penyelidikan klinikal dan juga pra klinikal. Antara bidang tersebut termasuklah audiologi, biokimia, pergigian, dietetik, pengimejan perubatan, sains bioperubatan, sinaran perubatan, pemakanan, optometri, farmakologi, farmasi, fisiologi, fisioterapi, terapi carakerja, sains forensik, kesihatan masyarakat, psikologi kesihatan, kesihatan persekitaran, sains pertuturan dan sains sukan. Buletin ini menerbitkan kertas asli, komunikasi pendek, laporan kes dan nota penyelidikan yang menarik minat ramai para sarjana. BSK diterbitkan oleh Sidang Pengarang daripada Fakulti Sains Kesihatan, Universiti Kebangsaan Malaysia. Selain itu para sarjana terkenal daripada universiti dalam dan luar negara dilantik sebagai ahli lembaga penasihat dan penilai artikel yang dikemukakan.

#### **PROSEDUR PENYERAHAN MANUSKRIP**

Buletin Sains Kesihatan menerbitkan manuskrip yang ditulis dalam Bahasa Melayu dan Bahasa Inggeris. Manuskrip yang diserahkan untuk diterbitkan dalam jurnal ini hendaklah karya asli yang belum pernah diterbitkan atau tidak dihantar serentak untuk pertimbangan oleh mana-mana penerbitan lain. Manuskrip perlu ditaip selang dua baris, ruangan tunggal dan saiz font 12 Times New Roman di atas kertas bersaiz A4 tidak melebihi 15 mukasurat bagi kertas asli (6 mukasurat bagi komunikasi pendek, laporan kes dan nota penyelidikan) dan hendaklah diserahkan melalui sistem atas talian.

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#### **FORMAT DAN GAYA**

Tajuk sesuatu manuskrip perlulah ringkas, deskriptif, dan seharusnya tidak melebihi 15 perkataan. Setiap manuskrip harus mempunyai abstrak, 150 hingga 250 perkataan dalam

bahasa Melayu dan bahasa Inggeris yang memperihalkan isi utamanya. Sekiranya manuskrip ditulis dalam bahasa melayu, abstrak dalam bahasa inggeris perlu disertakan.

Secara am, pembahagian isi merangkumi Pengenalan, Bahan dan Kaedah, Hasil dan Perbincangan, Kesimpulan dan Rujukan. Setiap manuskrip mesti disertakan dengan 3-5 kata kunci.

Semua ilustrasi termasuk rajah, carta dan graf, mesti dilabel dan disediakan dalam halaman yang berasingan daripada teks. Kedudukan ilustrasi seperti yang dikehendaki dalam teks hendaklah ditanda dengan jelas. Semua ilustrasi ini harus dirujuk dan dinomborkan secara berurutan sebagai rajah. Semua ilustrasi hendaklah sama ada dilukis dengan jelas menggunakan dakwat kekal, difotografkan dalam bentuk hitam putih atau warna dan dicetak di atas kertas yang bermutu, atau dalam bentuk imej digital, dan disediakan dalam bentuk *camera-ready*.

Rujukan dalam teks hendaklah menggunakan sistem nama penulis dan diikuti oleh tahun penerbitan. Satu senarai rujukan yang disusun mengikut abjad hendaklah dimasukkan di bahagian akhir sesebuah manuskrip. Kesemua rujukan yang dipetik dalam teks haruslah muncul dalam senarai rujukan. Para penulis bertanggungjawab memastikan ketepatan dan kesempurnaan maklumat dalam senarai rujukan. Semua manuskrip mesti mengikut garis panduan rujukan Penerbit, Universiti Kebangsaan Malaysia atau *The Chicago Manual of Style* (University of Chicago Press). Gaya rujukan yang digunakan haruslah konsisten di semua bahagian manuskrip.

#### **HAKCIPTA**

Para penulis bertanggungjawab sepenuhnya bagi memastikan manuskrip mereka tidak melanggar mana-mana hak cipta yang sedia ada. Para penulis seharusnya mendapat keizinan untuk menerbitkan semula atau mengubahsuai bahan-bahan yang mempunyai hak cipta, dan menunjukkan bukti keizinan tersebut semasa menyerahkan naskah akhir manuskrip.

#### **PROSES PENILAIAN**

Sesebuah manuskrip akan dinilai oleh Sidang Editor dan sekurang-kurangnya seorang pewartas bebas. Keputusan tentang penerbitan sesebuah manuskrip didasarkan kepada saranan ahli-ahli lembaga ini. Sesebuah manuskrip akan dinilai berasaskan kesesuaiannya dengan Buletin Sains Kesihatan, sumbangan kepada disiplin ilmu, kejituan analisis, keluasan konseptual, persembahan yang jelas, dan kesempurnaan teknikal. Nama penuh dan afiliasi semua penulis manuskrip hendaklah dinyatakan pada halaman depan yang dibuat secara berasingan dengan manuskrip. Manuskrip yang diserahkan oleh mana-mana anggota Sidang Editor juga tertakluk kepada prosedur penilaian yang sama.

#### **NASKAH SEMAKAN**

Satu set pruf akan dihantar kepada penulis bagi tujuan penyemakan kesilapan percetakan. Adalah menjadi tanggungjawab penulis untuk memaklumkan sebarang pembetulan kepada Sidang Editorial

## **BULLETIN OF HEALTH SCIENCES (BHS)**

### **Guide to Contributors**

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#### **SUBMISSION PROCEDURE**

The bulletin publishes manuscripts written in the Malay and English language. Manuscript submitted to the journal for publication should be original contribution and must not have been previously published or is under consideration simultaneously by any other publication.

The manuscript should be typed with double spacing, single column and font size 12 Times New Roman on A4 paper not exceeding 15 pages for original articles (5 pages for research notes, short communications and case reports) and should be submitted using the online submission system.

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## **FORMAT AND STYLE**

The title of a manuscript should be concise, descriptive and preferably not exceeding 15 words. The manuscript must include an abstract, describing its main points within 150 - 250 words in the Malay and English language. If the manuscript is written in Malay, it must also have an English abstract.

In general, the contents should comprise of Introduction, Materials and Methods, Results and Discussion, Conclusion, Acknowledgement and References. The manuscript should be supplied with 3-5 keywords.

All illustrations including figures, charts and graphs, must be labelled and supplied on pages separate from the text. The desired placement in the text should be clearly indicated. These illustrations should be referred to and numbered serial, as figures. All illustrations should be clearly drawn in permanent ink or photographed in sharp black and white and reproduced in the form of high - contrast glossy prints or digital images and provided in camera ready form.

References in the text should be denoted by giving the name(s) of the author(s). All alphabetically ordered references list should be included at the end of the manuscript. All references cited in the text must appear in the reference list. Authors are responsible for the accuracy and completeness of all information in the reference. Manuscripts must conform to the references in Penerbit UKM style or the Chicago Manual of Style (University of Chicago Press). The references style adopted should be consistent throughout the manuscript.

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**PROOFS**

One set of proofs will be sent to the author(s) to be checked for printer's errors and it is the responsibility of the author(s) to submit corrections to the Editorial Board.



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