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BAGAIMANA PERSONALITI INDIVIDU MEMPENGARUHI TEKANAN EMOSI SEMASA PANDEMIK COVID-19 DALAM KALANGAN PETUGAS KESIHATAN

Nawawi Bin Samad
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ABSTRAK

Kajian lepas mendapati penglibatan anggota kesihatan secara sukarela semasa pandemik virus kurang menggalakkan disebabkan kebimbangan kesan psikologikal yang mungkin berlaku. Kesan psikologikal bukan sahaja menjadi beban kepada mereka malah menjejaskan prestasi kerja dan akibatnya kualiti penjagaan pesakit turut merosot. Pemerkasaan faktor personaliti untuk menyokong penyertaan mereka sebagai barisan hadapan dalam mengawal pandemik virus masih baru dan belum banyak kajian dilakukan. Oleh itu, kajian ini bertujuan melihat sumbangan personaliti dalam mempengaruhi kebolehsuaian anggota kesihatan barisan hadapan terhadap tekanan dan kemurungan dalam konteks tempatan. Semua pembolehubah diukur menggunakan soal selidik yang telah diadaptasi ke Bahasa Melayu. Big Five Inventory (BFI) digunakan sebagai alat untuk mengukur personaliti manakala Depression Anxiety Stress Scales (DASS) digunakan bagi mengukur tekanan dan kemurungan. Data yang terkumpul daripada 313 petugas barisan hadapan telah dianalisa menggunakan analisis pengesahan faktor (CFA) dan model persamaan struktur (SEM) dalam program AMOS 22. Keputusan awal menunjukkan model pengukuran mempunyai indeks padanan yang sederhana. Setelah modifikasi, indeks padanan menjadi lebih baik; Chisq/df = 2.68; CFI = 0.95; TLI = 0.93; GFI = 0.96; RMSEA = 0.07; p < 0.01. Seterusnya analisa model struktural merumuskan model hipotesis dapat menerangkan peramal kemurungan dengan wajar. Didapati personaliti neurotik mempunyai pengaruh signifikan terhadap tekanan. Faktor tekanan juga meramal kemurungan dengan signifikan tetapi kemurungan tidak dipengaruhi oleh personaliti neurotik manakala tekanan menjadi faktor pengantara yang penting antara personaliti neurotik dengan kemurungan (pengantaraan penuh). Berdasarkan jumlah varian 40% untuk tekanan dan 32% untuk kemurungan, sumbangan faktor peramal adalah sederhana. Memandangkan faktor tekanan menjadi pengantara penuh bagi pengaruh personaliti neurotik terhadap kesan kemurungan, maka pengurusan organisasi wajar meningkatkan suasana kerja lebih kondusif untuk mengurangkan kesan tekanan dan secara tidak langsung

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meningkatkan kesiapsiagaan petugas barisan hadapan. Hasil kajian menunjukkan model peramal kemurungan petugas barisan hadapan ini sesuai digunakan dalam konteks tempatan.

Katakunci: *Pandemik COVID-19, Personaliti Neurotik, Tekanan Kerja, Kemurungan*

ABSTRACT

Previous studies have shown that the voluntary involvement of health personnel during a virus pandemic is less encouraging due to concerns about possible psychological effects. The psychological impact is not only a burden to them but also affects work performance, and as a result, the quality of patient care also declines. Empowering personality factors to support their participation as the front-line in controlling the virus pandemic is still new, and little research has been done. Therefore, this study aims to see the contribution of personality in influencing the adaptability of front-line health workers to stress and depression in the local context. All variables are measured using questionnaires adapted to the Malay language. The Big Five Inventory (BFI) instrument measures personality, while Depression Anxiety Stress Scales (DASS) measure stress and depression. Data collected from 313 front-line personnel were analyzed using confirmatory factor analysis (CFA) and structural equation modeling (SEM) in the AMOS 22 program. Preliminary results show that the measurement model has a moderate fit index. After the modification, the fit index became better; Chisq/df = 2.68; CFI = 0.95; TLI = 0.93; GFI = 0.96; RMSEA = 0.07; p < 0.01. Further, the structural model analysis formulates a hypothetical model that can properly explain the predictors of depression. It was found that neurotic personality has a significant influence on stress. Stress factors also significantly predict depression, but depression is not influenced by neurotic personality, while stress is an important mediating factor between neurotic personality and depression (full mediation). Based on the total variance of 40% for stress and 32% for depression, the contribution of the predictor factors was moderate. Given that stress factors fully mediate the influence of neurotic personality on the effects of depression, the organization's management should improve the work atmosphere to be more conducive to reducing the effects of stress and indirectly increasing the readiness of front-line workers. The study results show that this predictor model of front-line worker depression is suitable for use within the local context.

Keywords: *COVID-19 Pandemic, Neurotic Personality, Stress, Depression*

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1.0 PENGENALAN

Pada 11 Mac 2020 lalu, Pertubuhan Kesihatan Sedunia telah mengisytiharkan wabak COVID-19 sebagai virus pandemik terbaru. Ini susulan penyakit tersebut telah tersebar hingga menjangkau ke seluruh dunia dan memberi ancaman terhadap kesihatan dan kesejahteraan manusia. Ketika itu, sebanyak 118,000 kes telah dilaporkan dengan sejumlah 4,291 kematian melibatkan 114 buah negara (WHO, 2020). Namun, dalam tempoh sekitar dua tahun iaitu sehingga 19 Disember 2021, lebih 273 juta kes positif dilaporkan dengan kematian lebih 5.3 juta orang di seluruh dunia (WHO, 2021). Manakala, di Malaysia sehingga 31 Disember 2021, dilaporkan terdapat lebih 2.7 juta kes positif dengan kematian melebihi 31 ribu orang (Eton, 2021). Jumlah ini amat membimbangkan, apatah lagi pandemik ini dijangka mengambil masa yang lama untuk berakhir.

Pihak berwajib telah merancang dan melaksanakan pelbagai tindakan untuk mengekang penularan wabak berkenaan dalam negara ini. Sebagai pihak yang menerajui aspek kesihatan, Kementerian Kesihatan Malaysia (KKM) telah memperkemaskan aktiviti-aktiviti promosi, rawatan dan pemulihan khusus untuk menangani pandemik COVID-19 ini (KKM, 2021). Keupayaan hospital untuk merawat pesakit COVID-19 telah dipertingkatkan seperti menambah jumlah katil sedia ada dan meningkatkan bilangan alat-alat perubatan berkaitan, terutama mesin bantuan pernafasan. Apabila hospital-hospital sedia ada didapati kurang mampu menerima jumlah pesakit yang semakin bertambah, ditubuhkan pula Pusat Kuarantin Rawatan COVID-19 Risiko Rendah (PKRC). Melalui PKRC, pesakit-pesakit dengan kesan-kesan ringan tidak perlu dirujuk ke hospital lagi. Ini bagi memberi lebih keutamaan kepada pesakit-pesakit yang teruk menerima rawatan di hospital dengan kemudahan lebih lengkap. Inisiatif oleh pihak swasta juga dapat meringankan beban KKM melalui penubuhan PKRC swasta. Aktiviti-aktiviti pencegahan dan pengesanan turut dipertingkatkan. Antara tindakan yang dilaksanakan adalah melaksanakan saringan gejala di fasiliti-fasiliti kesihatan, pintu-pintu masuk antarabangsa, penubuhan *COVID-19 Assessment Centre* (CAC) di lokasi strategik bagi saringan pesakit positif dan pengurusan awal yang lebih tersusun, melaksanakan pemantauan kes COVID-19 gejala ringan dan kontak rapat yang menjalani kuarantin di rumah serta melaksanakan liputan pemberian vaksin yang menyeluruh untuk masyarakat.

Di sebalik tindakan agresif dan proaktif pihak berwajib ini, kejayaan tidak mampu dicapai tanpa kesiapsiagaan anggota kesihatan barisan hadapan

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yang berdepan secara langsung dengan virus COVID-19. Ini kerana peranan sumber tenaga manusia berkemahiran tinggi dan cukup bersedia sangat penting semasa wabak pandemik (Manuell et al., 2011). Kepakaran anggota kesihatan diperlukan untuk mengendalikan sumber-sumber perubatan dan melaksanakan proses kerja dengan berkesan bagi membendung wabak secara langsung. Apatah lagi anggota kesihatan barisan hadapan perlu bersedia daripada segi fizikal dan mental semasa rawat pesakit.

Walau bagaimanapun, berdasarkan pengalaman pandemik virus H1N1 pada tahun 2009, didapati penglibatan anggota kesihatan sebagai suatu rasa tanggungjawab dalam menangani pandemik virus kurang menggalakkan (Wong et al., 2010). Kajian di Hong Kong mendapati 33.3% jururawat enggan menjadi petugas barisan hadapan, manakala 43.6% responden lagi berpendirian tidak pasti jika diminta untuk mengendalikan pesakit. Penyebab utama keengganan tersebut ialah tekanan psikologi semasa menjalankan tugas berisiko (55%) dan perasaan bimbang kemudaratan akan berlaku kepada diri dan ahli keluarga mereka (26.2%). Golongan ini juga dikenalpasti sebagai kumpulan pekerja kesihatan yang cenderung untuk mendapat kemurungan dan tekanan emosi yang tinggi (Zaka et al., 2020). Kurangnya penglibatan menyeluruh anggota kesihatan semasa berhadapan pandemik virus terjadi atas pelbagai sebab (Manuell et al., 2011). Antara yang terpenting ialah kebimbangan keselamatan diri dan ahli keluarga, takut mendapat jangkitan dan moral yang rendah (diburukkan lagi oleh penyebaran penyakit yang pantas) selain kekhuatiran petugas barisan hadapan sendiri mendapat jangkitan.

Sebenarnya tekanan emosi dalam kalangan anggota kesihatan bukan hanya berlaku semasa wabak pandemik virus sahaja. Ini kerana petugas kesihatan merupakan antara golongan pekerja yang dikaitkan dengan tekanan kerja lebih tinggi berbanding kategori pekerjaan lain (Rossler, 2012). Kajian mendapati sifat pekerjaan yang mengundang risiko kepada fizikal dan mental lebih cenderung untuk mencetuskan kemurungan. Ini terutamanya persekitaran tugas sebagai anggota kesihatan barisan hadapan. Di Australia, kajian mendapati 32.4% jururawat mendapat kemurungan walaupun semasa melaksanakan tugas-tugas rutin di hospital, manakala 41.2% lagi dilaporkan mengalami tekanan kerja (Maharaj et al., 2019). Kajian dalam kalangan jururawat di China mendapati faktor beban tugas antara penyebab tekanan emosi dalam kalangan jururawat (Bo Gu et al., 2019). Manakala kajian di Malaysia mendapati 28.6% pegawai perubatan mengalami kesan kebimbangan, diikuti kemurungan (10.7%) dan tekanan kerja (7.9%) semasa

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melaksanakan tugasan rutin (Siti Nasrina Yahaya et al., 2018). Situasi ini memberi gambaran, tekanan emosi akan menjadi lebih besar apabila berhadapan dengan situasi pandemik virus yang lebih mencabar.

Walaupun sifat pekerjaan yang mengundang risiko kepada fizikal dan mental lebih cenderung mengakibatkan tekanan emosi dalam kalangan pekerja, namun dari aspek lain, reaksi emosi sebenarnya tidak sama bagi setiap individu. Ini kerana, terdapat faktor pelindung yang penting iaitu ciri-ciri personaliti pekerja mampu mengawal sejauh mana kesan tekanan emosi dalam situasi kerja kritikal (Meadows et al., 2011). Ciri-ciri personaliti individu bersifat tekal dan merupakan komponen daya tahan penting semasa berhadapan situasi sukar (Carpenter et al., 2010). Oleh itu, anggota kesihatan dengan ciri-ciri personaliti yang sesuai akan berfungsi dengan baik semasa melaksanakan tugas-tugas berisiko. Sebaliknya, jenis personaliti tertentu boleh mendorong anggota kesihatan untuk mengalami tekanan kerja dan kemurungan.

Personaliti merujuk kepada penyusunan psikologikal dinamik dalam diri individu yang mengkoordinasi tindakan dan pengalaman serta menjadi faktor yang menyebabkan perbezaan antara individu dengan individu yang lain (McCrae & Costa, 2008). Model personaliti lima faktor adalah antara pendekatan yang paling popular dalam kajian-kajian berkaitan tingkah laku organisasi (Gosling et al., 2003). Ini kerana model ini berjaya dibuktikan sebagai faktor peramal yang baik dalam menjelaskan hubungan antara personaliti dengan reaksi tingkah laku dalam organisasi (Raad & Mlacic, 2015; Robbins & Judge, 2013). Model personaliti lima faktor adalah satu kelompok taksonomi yang mengandungi lima dimensi tret umum (Gosling et al., 2003). Dimensi tersebut adalah ekstraversi, kepersetujuan, kehematan, neurotik (atau kestabilan emosi) dan keterbukaan. Setiap individu memiliki kesemua dimensi ini, namun dalam tahap yang berbeza-beza mengikut keperibadian masing-masing.

Kajian-kajian lepas telah membuktikan bahawa sesetengah dimensi personaliti kurang memberi faktor pelindung kepada pekerja semasa berhadapan situasi sukar dan mencabar. Dimensi neurotik (kestabilan emosi) didapati sangat berkait dengan tekanan emosi berbanding dimensi personaliti lain (Vugicic & Randelovic, 2017; Koorevaar et al., 2013; Hakulinen et al., 2015). Individu yang tinggi sifat neurotik (rendah kestabilan emosi) cenderung untuk mudah gelisah, tertekan, rasa rendah diri dan bertindak secara impulsif (Panchu et al., 2016). Ini mendedahkan individu berkenaan untuk mendapat tekanan emosi dalam situasi kerja yang mencabar dan berisiko. Dalam konteks

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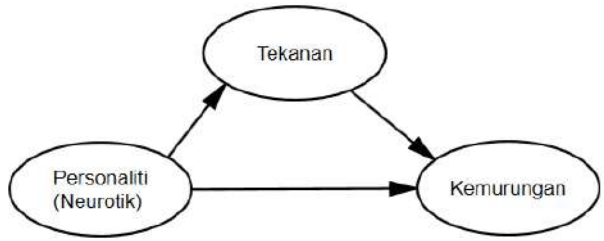
pengurusan pendemik COVID-19, kesan emosi negatif bukan sahaja menjadi beban kepada petugas barisan hadapan tetapi juga menjejaskan prestasi kerja dan akibatnya kualiti penjagaan pesakit turut merosot.

Ujian untuk menentukan jenis personaliti sebagai syarat untuk memasuki perkhidmatan awam bukanlah keperluan yang diwajibkan di negara ini. Penempatan anggota untuk bertugas di barisan hadapan menangani pandemik COVID-19 juga tidak menggunakan kriteria jenis personaliti sebagai syarat keterlibatan. Berikutan kategori pekerja kesihatan sentiasa berhadapan dengan persekitaran kerja berisiko, Maharaj et al. (2019) mencadangkan kajian lanjut dibuat bagi mengenalpasti strategi dan intervensi yang boleh menyumbang kepada kesan emosi positif dan secara tidak langsung menambahbaik kualiti penjagaan pesakit. Intervensi oleh pengurusan atasan kepada petugas barisan hadapan semasa pandemik virus, bukan sahaja dalam memberi latihan khusus kawalan jangkitan tetapi juga menangani keperluan psikologikal mereka (Wong et al., 2010; Zaka et al., 2020). Ini akan memastikan kesediaan petugas barisan hadapan memberi perkhidmatan yang berkesan dengan rasa tanggungjawab.

Sehubungan itu, kajian ini bertujuan mengenalpasti pengaruh personaliti terhadap tekanan dalam kalangan pekerja kesihatan barisan hadapan serta peranan tekanan kerja sebagai faktor pengantara kepada kesan kemurungan. Kajian-kajian lepas sangat sedikit melihat peranan faktor pengantara yang menghubungkan personaliti dengan kemurungan. Apatah lagi, konteks kajian ketika pandemik virus belum lagi diteroka. Walaupun faktor kebimbangan juga sering digandingkan apabila merujuk tekanan emosi, namun pemboleh ubah tersebut tidak temasuk dalam konteks kajian ini. Ini kerana faktor kebimbangan dan kemurungan berkongsi ciri-ciri umum apabila digandingkan (Barlow & Durand, 2009).

Pengkaji berpandangan, faktor kemurungan lebih penting kerana melibatkan perubahan afektif individu yang lebih ketara dan kesan yang lebih teruk. Pengoperasian kajian ini menggunakan teori klasikal hubungan personaliti-kemurungan Klein et al. (2011) menerusi subkategori model kecenderungan. Model kecenderungan mencadangkan, faktor personaliti individu mempunyai kesan kepada kemunculan dan pengekalan keadaan kemurungan. Selain itu, kemurungan berlaku hasil tindakbalas kompleks antara personaliti dengan beberapa faktor risiko lain. Faktor-faktor risiko ini berfungsi samada sebagai pengantara atau penyederhana dalam hubungan tersebut. Sehubungan itu, kerangka model kajian ini adalah seperti Rajah 1.

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Rajah 1: *Kerangka Konseptual kajian*

Kesan emosi negatif dalam kajian ini merujuk kepada tekanan kerja dan kemurungan. Tekanan adalah keadaan dalam diri individu di mana berlakunya ketidakupayaan untuk menyelaraskan sumber sedia ada dengan permintaan persekitaran (Sarafino, 2008). Kesan daripada keadaan tersebut menimbulkan tindakbalas psikologikal dan fisiologikal dalam diri individu. Manakala kemurungan adalah gangguan atau penyakit mental yang dicirikan dengan kesan psikologikal, fisiologikal dan sosiologikal seperti kesedihan, hilang minat dan inisiatif kepada aktiviti yang disukai sebelum ini, perasaan bersalah atau tidak berguna, kesukaran berfikir atau membuat keputusan, perubahan selera makan, kurang penjagaan diri, percakapan dan pergerakan yang perlahan, masalah tidur atau berfikir tentang kematian (Santangelo et al., 2019).

Memandangkan kajian ini menggunakan definisi konsep dan operasi daripada teori negara barat yang berbeza konteks budaya maka, model yang dicadangkan perlu dibuktikan sesuai untuk digunakan di negara ini. Ini membawa kepada pembentukan hipotesis pertama kajian ini iaitu:

H1: Terdapat kesepadanan model hipotesis peramal kemurungan dengan data kajian dalam analisis model persamaan struktur.

Hubungan langsung antara setiap pembolehubah telah dikaji oleh pengkaji-pengkaji lepas. Perkaitan personaliti dengan tekanan kerja memang telah dibuktikan, khususnya penemuan hubungan positif yang konsisten bagi dimensi neurotik dengan tekanan (Hudek-Knezevic et al.,

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2011; Song E. Kim et al., 2016; Panchu et al., 2016; Perez-Fuentes et al., 2019; McManus et al., 2004). Oleh itu, hipotesis kedua kajian ini ialah:

H2: Terdapat pengaruh langsung personaliti neurotik yang signifikan terhadap tekanan kerja.

Berbanding kebanyakan kajian melihat hubungan personaliti dengan tekanan kerja, kurang kajian dibuat bagi meneroka hubungan personaliti dengan kemurungan dalam kalangan anggota kesihatan (Duan-Porter et al., 2018). Namun, beberapa kajian menunjukkan terdapat hubungan positif antara dimensi neurotik dengan kemurungan (Meng Shi et al., 2015; Song E. Kim et al., 2016). Oleh itu, hipotesis ketiga kajian ini ialah:

H3: Terdapat pengaruh langsung personaliti neurotik yang signifikan terhadap kemurungan.

Kajian-kajian lepas juga mendapati keputusan konsisten bagi hubungan positif tekanan kerja dengan kemurungan (Moreira & Furegato, 2013; Song E. Kim et al., 2016; Huey-S Lin et al., 2010). Ini disebabkan, terdapatnya perkaitan konsep dan teori antara kedua-dua pembolehubah tersebut (Hammen, 2005). Oleh itu, hipotesis keempat kajian ini ialah:

H4: Terdapat pengaruh langsung tekanan kerja yang signifikan terhadap kemurungan.

Hubungan tidak langsung antara personaliti dengan kemurungan melalui faktor pengantara masih belum dikaji dengan meluas. Kajian yang ada mendapati tekanan kerja dapat menjadi faktor pengantara bagi pengaruh tersebut hanya melalui satu jenis tret personaliti sahaja iaitu neurotik (Song E. Kim et al., 2016). Oleh itu, hipotesis kelima kajian ini ialah:

H5: Terdapat pengaruh tidak langsung personaliti neurotik yang signifikan terhadap kemurungan melalui pengantaraan tekanan kerja.

Hubungan dan pengaruh bagi setiap pemboleubah yang digunakan dalam kajian ini belum diteroka dengan meluas dalam konteks negara ini khususnya untuk petugas kesihatan. Justeru itu, penemuan kajian adalah penting bagi membantu pihak atasan merancang intervensi yang objektif

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dan sesuai bagi memastikan kesiapsiagaan petugas barisan hadapan semasa pandemik COVID-19. Malah penggunaan pembolehubah tekanan kerja sebagai pengantara juga masih tidak banyak dilakukan. Oleh itu, kajian ini akan mengembangkan teori sedia ada melalui pengenalan fungsi faktor pengantara.

2.0 METODOLOGI

Lokasi kajian melibatkan tujuh hospital awam di Negeri Sembilan dengan dua daripadanya terlibat secara langsung dalam rawatan kes positif COVID-19, manakala lima hospital lagi menjalankan aktiviti saringan dan pengesahan kes. Responden terdiri daripada petugas barisan hadapan dalam tiga kategori tugasan iaitu tugasan penjagaan pesakit (wad isolasi; unit rawatan rapi), tugasan saringan dan pengesahan (kaunter saringan pintu masuk hospital) serta tugasan sokongan (makmal, bilik mayat). Hanya petugas barisan hadapan yang terlibat secara langsung dalam menangani pandemik COVID-19 diterima sebagai sampel kajian. Bentuk kajian adalah secara kuantitatif dan keratan rentas serta penggunaan soal selidik. Kaedah kajian menggunakan sampel bertujuan. Terdapat kira-kira 500 orang petugas barisan hadapan yang terlibat.

Kelulusan diperolehi untuk menjalankan kajian daripada Jawatankuasa Etika Kementerian Kesihatan Malaysia (NMRR-20-875-54720 [IIR]). Pentadbiran soal selidik dilaksanakan pada awal bulan Jun tahun 2020. Soal selidik disediakan dalam format *Google Form* dan diedarkan melalui kumpulan media sosial yang digunakan petugas barisan hadapan dengan sebaran alamat URL atau *QR code scan*. Kaedah sebaran secara atas talian lebih sesuai berikutan tempoh Perintah Kawalan Pergerakan oleh Kerajaan yang menghadkan pergerakan ketika itu. Subjek kajian dimaklumkan berkaitan penglibatan secara sukarela dan jaminan kerahsiaan maklumat serta data yang diperolehi hanya untuk kajian sahaja. Maklumbalas dikumpulkan dalam tempoh seminggu. Terdapat sejumlah 327 maklumbalas diterima iaitu pada kadar 65.4%.

Alat ukur personaliti menggunakan BF Inventory (John et al., 1991) mengandungi 44 item versi Bahasa Melayu (Nawawi, 2017). Soal selidik ini mengandungi *five-point Likert Scale* daripada nilai 1 (sangat tidak setuju) sehinga nilai 5 (sangat setuju). Walau bagimanapun, sesuai dengan objektif kajian, hanya dimensi neurotik sahaja digunakan untuk analisa. Alat ukur

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tekanan, kebimbangan dan kemurungan menggunakan DASS scale (Lovibond & Lovibond, 1995) mengandungi 21 item versi Bahasa Melayu (Ramli et al., 2009). Soal selidik tersebut mengandungi *four-point Likert Scale* daripada nilai 0 (tidak pernah) sehingga nilai 3 (sangat banyak). Walau bagimanapun sesuai dengan objektif, hanya komponen tekanan dan kemurungan sahaja digunakan untuk analisa. Selain itu, terdapat soalan berkaitan demografi iaitu jawatan, gred, jantina, status perkahwinan, bangsa, umur, jabatan, stesen bertugas, dan jenis tugasan. Oleh itu, jumlah soalan yang digunakan ialah sebanyak 31 iaitu 8 soalan untuk mengukur personaliti neurotik, 7 soalan untuk mengukur tekanan kerja, 7 soalan untuk mengukur kemurungan dan 9 soalan untuk maklumat demografi responden.

Analisa deskriptif bagi menggambarkan taburan maklumat demografi subjek kajian dibuat menggunakan perisian SPSS versi 22. Analisa kekerapan bagi menunjukkan kategori jantina, bangsa, umur, gred jawatan, dan jenis profesion, manakala analisa taburan skor majoriti oleh subjek kajian bagi menunjukkan perbandingan skor purata dan sisihan piawai untuk dimensi personaliti neurotik, tekanan tugas, dan kemurungan. Seterusnya, pengujian hipotesis dibuat melalui analisa model persamaan struktur *(structural equation model)* menggunakan perisian AMOS versi 22. Proses analisa model persamaan struktur dilakukan melalui dua peringkat iaitu peringkat model pengukuran dan peringkat model struktur (Mueller & Hancock, 2008).

Model pengukuran boleh diuji dalam analisis pengesahan faktor *(Confirmatory Factor Analysis)* atau CFA. Jika didapati terdapat item ukuran yang tidak sepadan dengan model pengukuran, maka item berkaitan perlu disingkirkan (Zainudin, 2013). Kesepadanan model *(model fit)* pula membandingkan model hipotesis supaya dapat menjelaskan dengan secukupnya data sampel yang digunakan (Hair et al., 2010). Panduan untuk mendapat syarat minimum kesepadanan model iaitu melaporkan nilai indeks *chi-square* ($\chi 2$), *degree of freedom* (df), *Comparative Fit Index* (CFI), *Tucker Lewis Index* (TLI), *Root Mean Square Error of Approximation* (RMSEA) dan *Chisq/df* (Hair et al., 2010; Hooper et al., 2008) mengikut *cut-off value* yang ditetapkan. Setelah analisa CFA mendapat model yang sepadan dengan data kajian, ujian kebolehpercayaan dan kesahan model dilakukan.

Kebolehpercayaan (ketekalan dalaman) boleh diukur melalui analisis *Composite Reliability* atau CR (Hair et al., 2014). Manakala kesahan konstruk boleh diukur melalui tiga petunjuk iaitu kesahan *nomological*, kesahan konvergen dan kesahan diskriminan (Hair et al., 2010). Ujian kesahan *nomological* didapati melalui analisis korelasi antara konstruk. Korelasi yang

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signifikan dan wajar secara teoretikal menunjukkan kesahan *nomological* tercapai. Ujian kesahan konvergen didapati melalui analisis *Average Variance Extracted* (AVE). Selain itu, kriteria *Fornell-Larcker* digunakan sebagai pendekatan dalam menilai kesahan diskriminan (Hair et al., 2014). Menerusi kriteria ini, punca kuasa dua nilai AVE dibandingkan dengan korelasi antara konstruk. Sekiranya punca kuasa dua AVE sesuatu konstruk lebih tinggi dari korelasi konstruk tersebut dengan konstruk lain, maka kesahan diskriminan adalah tercapai.

Di peringkat analisa model struktur, hipotesis kajian dibuktikan melalui penilaian nilai parameter yang menghubungkan pembolehubah bebas dengan pembolehubah terikat. Nilai *variance* pembolehubah terikat yang disumbangkan oleh pembolehubah bebas bagi menggambarkan kepentingan pembolehubah berkaitan turut dijelaskan (Hair et al., 2011). Selain itu ujian pengantaraan turut dilakukan mengunakan kaedah Zhao et al. (2010). Prosedur pengujian pengantara dibuat melalui pembentukan satu model struktural keseluruhan di mana terdapat dua kriteria utama yang perlu diperiksa iaitu kesignifikanan laluan tidak langsung dan laluan langsung. Tidak ada lagi syarat hubungan signifikan bagi setiap hubungan langsung terlebih dahulu seperti kaedah Baron & Kenny (1986). Bagi pengujian kesignifikanan, kaedah analisis *bootstraping* kajian ini melalui penggunaan 2,000 sampel semula dan *bias-corrected confidence interval* (Warner, 2013).

3.0 KEPUTUSAN

Berdasarkan analisa awal, sejumlah 14 respons disingkirkan berikutan data tidak lengkap melebihi 15% dan skor yang melampau. Baki respons untuk analisa selanjutnya berjumlah 313. Memandangkan maklumat diperolehi daripada subjek yang sama untuk kedua-dua pembolehubah bebas dan terikat, maka analisa *common method bias* (CMB) dilakukan melalui kaedah *Harman's single-factor test* (Podsakoff et al., 2012). Keputusan mendapati faktor utama hanya menjelaskan 33.8% dari keseluruhan *variance* iaitu lebih rendah dari nilai *cut-off* 50%. Ini menandakan isu CMB kurang memberi kesan kepada kajian. CMB berlaku apabila soal selidik untuk mengukur pemboleh ubah bebas dan terikat dilaksanakan secara serentak kepada responden yang sama. Ini boleh menghasilkan *variance* tambahan yang tidak disengajakan dan *bias* kepada keputusan kajian (Krishnaveni & Deepa, 2013).

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Jadual 1: ***Taburan Profil Responden Kajian***

Pembolehubah	Kategori	Kekerapan	Peratus
Bangsa	Melayu	273	87.2
	India	28	8.9
	Bumiputera (Lain-lain)	12	3.8
Jantina	Lelaki	103	32.9
	Perempuan	210	67.1
Profesion	Pegawai Perubatan	14	4.5
	Jururawat	196	62.6
	Pen. Peg. Perubatan	65	20.8
	Pem. Perawatan Kesihatan	29	9.3
	Lain-lain	9	2.87
Umur	20-30 tahun	134	42.8
	31-40 tahun	124	39.6
	41-50 tahun	42	13.4
	51-60 tahun	13	4.2
Tempat Bertugas	Hospital COVID-19	172	55.0
	Hospital bukan COVID-19	75	24.0
	Lain-lain	66	21.0

Analisa taburan profil responden kajian di Jadual 1 menunjukkan majoriti adalah berbangsa Melayu (87%), perempuan (67%), Jururawat (62%), kumpulan Sokongan I (83%), umur antara 20 hingga 30 tahun (42%) dan bertugas di Hospital COVID-19 (55%). Analisa deskriptif selanjutnya bagi menjelaskan profil dimensi personaliti neurotik, tahap tekanan tugas dan kemurungan mengikut empat kategori interpretasi iaitu rendah, sederhana rendah, sederhana tinggi dan tinggi. Merujuk Jadual 3 berdasarkan nilai min, majoriti responden mempunyai profil personaliti neurotik pada tahap 'sederhana rendah' dan tahap 'rendah' untuk tekanan tugas serta kemurungan. Namun demikian, nilai tekanan tugas lebih tinggi berbanding kemurungan iaitu 0.46 dan 0.22 masing-masing. Kesemua skor berada antara 0.28 hingga 0.52 sisihan piawai maka, majoriti skor (84.13%) berada berhampiran dengan nilai purata (dalam lingkungan 1 sisihan piawai). Ini menunjukkan nilai skor adalah seragam iaitu menggambarkan persepsi responden adalah hampir sama

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3.1 Model Pengukuran

Model pengukuran awal mengandungi 3 konstruk pendam dengan 22 item ukuran. Analisa indeks kesepadanan ialah Chisq/df = 1.99; CFI = 0.91; TLI = 0.90; GFI = 0.89; RMSEA = 0.06 dengan nilai khi kuasa dua ($\chi 2$) adalah signifikan ($p < 0.01$). Pada umumnya keputusan nilai kesepadanan ini adalah sederhana. Walaupun nilai $\chi 2$ adalah signifikan yang memberi gambaran model tidak mewakili data kajian, namun menurut Hair et al. (1996) dan Joreskog & Sorbom (1996), nilai $\chi 2$ signifikan boleh diabaikan jika saiz sampel melebihi 200 orang (dlm. Zainudin, 2013) iaitu seperti dalam kajian ini. Oleh itu, tindakan seterusnya adalah untuk memperbaiki indeks kesepadanan yang lain.

Berikutan nilai kesepadanan model yang sederhana maka, modifikasi model dilakukan dengan menilai pemuatan piawai setiap item untuk mendapatkan sifat *unidimensionality* (Zainudin, 2013). Nilai pemuatan sepatutnya lebih besar dari 0.50 bagi menunjukkan kekuatan item ukuran untuk mewakili konstruk yang diukurnya (Hair et al., 2010). Oleh itu, item-item yang mempunyai nilai pemuatan rendah dibuang satu per satu disamping merujuk nilai residual piawai *(standardized residual)* dan indeks modifikasi *(modification indices)* seperti dicadangkan oleh Byrne (2010). Hasilnya 4 item ukuran yang mempunyai nilai pemuatan rendah disingkirkan iaitu 3 item untuk konstruk kemurungan dan 1 item untuk neurotik. Analisa indeks kesepadanan ialah Chisq/df = 1.79; CFI = 0.95; TLI = 0.94; GFI = 0.93; RMSEA = 0.05 dengan nilai khi kuasa dua ($\chi 2$) adalah signifikan ($p < 0.01$). Nilai kesepadanan ini adalah memuaskan dan dianggap dapat mewakili sampel kajian. Jadual 2 menunjukkan nilai pemuatan kesemua 18 item ukuran melebihi 0.50 (model modifikasi 1) disamping mempunyai nilai kebolehpercayaan yang baik (CR > 0.60). Walau bagimanapun, kesemua item ukuran belum mencukupi syarat sebagai alat ukur yang sah berikutan nilai AVE rendah dari nilai 0.50 bagi konstruk masing-masing.

Proses modifikasi model dilanjutkan dengan menyemak nilai residual piawai yang besar (> 2.50) dan indeks modifikasi untuk melihat kewujudan pemuatan silang seperti cadangan Hair et al. (2010). Namun tiada nilai residual piawai terlalu besar dan tiada silang pemuatan antara item bagi konstruk berlainan. Menurut Zainudin (2013), bagi alat ukur yang telah digunakan dengan meluas, nilai pemuatan setiap item sebenarnya perlu lebih daripada 0.60. Memandangkan soal selidik dalam kajian ini merupakan alat ukur yang telah digunakan oleh ramai pengkaji lain, maka nilai pemuatan setiap item disemak semula. Berikutan itu, item yang mempunyai nilai pemuatan lebih rendah daripada 0.60 digugurkan. Model pengukuran akhir (modifikasi 2)

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mengandungi 9 item ukuran (Jadual 2). Indeks kesepadanan akhir ialah Chisq/df = 2.68; CFI = 0.95; TLI = 0.93; GFI = 0.96; RMSEA = 0.07; $p < 0.01$ dan diterima sebagai model terbaik untuk mewakili sampel kajian. Walaupun nilai indeks Chisq/df dan RMSEA lebih rendah berbanding model 18 item ukuran, namun nilai tersebut masih dalam julat yang dibenarkan. Jadual 2 juga menunjukkan kesemua item ukuran mencapai syarat kebolehpercayaan dan kesahan berdasarkan nilai CR dan AVE yang lebih besar daripada 0.60 dan 0.50 untuk setiap konstruk masing-masing.

Analisa lanjutan untuk syarat kesahan *nomological* dan *discriminant* (Jadual 3) juga menunjukan model 9 item merupakan model terbaik untuk analisa selanjutnya. Ini kerana korelasi antara konstruk yang signifikan ($p < 0.01$) dan nilai punca kuasa dua AVE yang lebih besar daripada nilai korelasi dengan konstruk lain.

Merujuk model akhir, konstruk tekanan mempunyai baki 2 item. Menurut Hair et al. (2010), konstruk yang diwakili oleh 2 item ukuran sahaja tidak mencukupi untuk analisa selanjutnya. Namun bagi memperbaiki pemuatan faktor, kebolehpercayaan dan kesahan setiap konstruk yang lebih penting, maka item yang lemah terpaksa digugurkan. Dalam keadaan yang tidak dapat elakkan, Worthington dan Whittaker (2006) mencadangkan 2 item boleh dikekalkan jika masih mampu menafsirkan konstruk berkenaan dengan cukup. Setelah semakan dibuat, soalan bagi DASS11 (saya dapati diri saya semakin gelisah) dan DASS12 (Saya rasa sukar untuk relaks) didapati memadai bagi mewakili konstruk tekanan semasa bertugas. Malahan, menurut Bollen (1989) bilangan 2 item masih memadai untuk mengukur konstruk dengan syarat jumlah sampel yang digunakan adalah besar (dalam konteks kajian ini melebihi 300 sampel).

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Jadual 2: ***Analisa Kebolehpercayaan dan Kesahan Model Pengukuran***

Konstruk	Model 18 item ukuran (modifikasi 1)				Model 9 item ukuran (modifikasi 2)			
	Item	Pemuatan	CR (> 0.60)	AVE (> 0.50)	Item	Pemuatan	CR (> 0.60)	AVE (> 0.50)
Neurotik	BFI_4	0.704	0.86	0.46	BFI_4	0.741	0.80	0.51
	BFI_14	0.737			BFI_14	0.672		
	BFI_19	0.689			BFI_19	0.670		
	BFI_39	0.627			BFI_9R	0.761		
	BFI_9R	0.729						
	BFI_24R	0.648						
	BFI_34R	0.594						
Tekanan	DASS_1	0.583	0.83	0.41	DASS_11	0.807	0.66	0.504
	DASS_6	0.596			DASS_12	0.600		
	DASS_8	0.623						
	DASS_11	0.674						
	DASS_12	0.691						
	DASS_14	0.689						
	DASS_18	0.589						
Kemurungan	DASS_5	0.651	0.76	0.44	DASS_10	0.730	0.77	0.53
	DASS_13	0.676			DASS_17	0.680		
	DASS_16	0.725			DASS_21	0.764		
	DASS_17	0.591						

* CR = *Composite Reliability.* ** AVE = *Average Variance Extracted*

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Jadual 3: ***Analisa Deskriptif dan Kesahan Nomological serta Discriminant***

Konstruk	1	2	3
(1) Neurotik	*0.712*		
(2) Tekanan Tugas	0.633	*0.710*	
(3) Kemurungan	0.465	0.545	*0.725*
Min	2.200	0.460	0.220
Sisihan Piawai	0.520	0.370	0.280

*Kesemua korelasi antara konstruk adalah signifikan ($p < 0.01$).
**Nombor serong (*diagonal*) menunjukkan punca kuasa dua AVE

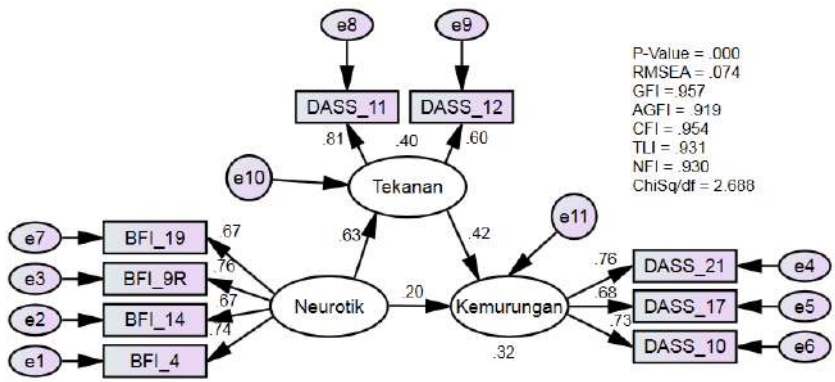
Seterusnya penilaian taburan seragam data dilakukan khususnya untuk *multivariate normality*. Ini kerana analisa persamaan struktur menggunakan teknik MLE *(Maximum Likehood Estimation)* mensyaratkan taburan normal (Byrne, 2010). Hasil analisa mendapati nilai *multivariate kurtosis* ialah 34.758 iaitu lebih tinggi daripada nilai 21.408 (Shengyi et al., 2008). Ini menandakan, data yang diperolehi daripada responden kajian bukan taburan normal. Walaupun terdapat teknik bagi transformasi data supaya menjadi hampir normal, namun menurut Shengyi et al. (2008) kaedah tersebut tidak sesuai dilakukan untuk analisa persamaan struktur. Apatah lagi menurut Counsell et al. (2011) keadaan data yang tidak bertaburan normal biasa terjadi bila menggunakan konstruk berkaitan dengan masalah emosi atau mental memandangkan majoriti responden adalah sihat. Bagi mengatasi masalah ini, Byrne (2010) dan Zainudin et al., (2015) mencadangkan kaedah *non-parametric bootstrapping* digunakan untuk analisa selanjutnya tanpa perlu mengubahsuai data. Seterusnya, analisa persamaan struktur dilanjutkan melalui dua teknik iaitu *bootstrapping* dan *Bollen-Stine bootstrap* seperti disyorkan oleh Baldwin dan Caldwell (2003).

3.2 Model Struktural dan pengujian hipotesis

Pengujian hipotesis berdasarkan pembinaan satu model struktural keseluruhan dibuat dalam dua peringkat. Peringkat pertama melibatkan

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dimensi personaliti neurotik sebagai pemboleh ubah *exogenous* manakala konstruk tekanan tugas dan konstruk kemurungan sebagai pemboleh ubah *endogenous*. Pada masa yang sama, konstruk tekanan tugas mempunyai peranan kedua sebagai pemboleh ubah *exogenous* bagi konstruk kemurungan. Tahap kedua pula melibatkan pengujian model yang mengandungi konstruk tekanan tugas sebagai pemboleh ubah pengantara dalam menentukan sumbangan dimensi personaliti neurotik terhadap konstruk kemurungan. Keputusan analisis model persamaan struktur seperti di Rajah 2 menunjukkan terdapat kesepadanan model hipotesis peramal kemurungan dengan data kajian. Analisa indeks kesepadanan model mendapati kesemua indeks melepasi nilai ditetapkan [$\chi 2$ (N = 313, df = 24) = 64.513, p < 0.01]. Keputusan ini mengesahkan hipotesis 1 disokong.



Rajah 2: *Model Struktural Keseluruhan (nilai piawai)*

Setelah mendapatkan nilai kesepadanan model yang baik, pemeriksaan kepada nilai parameter laluan dibuat. Merujuk jadual 4, keputusan analisis statistik mendapati hanya hipotesis 2 dan hipotesis 3 disokong iaitu pengaruh signifikan dimensi personaliti neurotik terhadap tekanan (β = 0.663, SE = 0.071, 95% *bootstrapping* CI= 0.482 *to* 0.759, p < 0.01) dan pengaruh signifikan tekanan terhadap kemurungan (β = 0.418, SE = 0.169, 95% *bootstraping* CI= 0.094 *to* 0.758, p < 0.05).

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Pembolehubah *endogenous* tekanan memperoleh jumlah varian paling besar iaitu 40% diikuti oleh kemurungan iaitu 32%. Berdasarkan kriteria Hair et al. (2011), sumbangan faktor peramal terhadap tekanan tugas dan kemurungan adalah pada tahap sederhana.

Seterusnya analisa kesan pengantaraan (Jadual 5) mendapati faktor tekanan tugas menjadi pengantara yang signifikan bagi pengaruh dimensi personaliti neurotik terhadap kemurungan (β = 0.265, SE = 0.122, 95% *bootstraping* CI= 0.055 *to* 0.068, p < 0.01). Memandangkan pengaruh langsung dimensi personaliti neurotik terhadap kemurungan tidak signifikan, maka jenis pengantaraan ialah kesan tidak langsung. Merujuk kaedah oleh Zhao et al. (2010), jenis pengantaraan ini juga dikenali sebagai pengantaraan penuh.

4.0 PERBINCANGAN

Keputusan analisis SEM mendapati model konseptual hipotesis kajian iaitu model peramal tekanan emosi mempunyai padanan mencukupi *(model fit)* bagi sampel petugas barisan hadapan yang digunakan. Ini berdasarkan keputusan indeks padanan melepasi nilai minimum bagi tiga kategori pengujian *absolute, incremental* dan *parsimony* seperti dicadangkan oleh Hair et al. (2010). Melalui teknik statistik SEM, diagnosis mendapati beberapa item ukuran adalah lemah yang perlu digugurkan. Modifikasi semula model tersebut adalah wajar memandangkan soal selidik yang digunakan adalah dipelopori di Barat yang berkemungkinan kurang sesuai dalam konteks negara ini. Justeru itu, penemuan nilai padanan yang baik untuk model akhir menunjukkan bahawa kesemua konstruk dapat diwakili oleh set soal selidik dengan berkesan meskipun diambil atau diadaptasi dari Barat. Berdasarkan cadangan Davcik (2014), keputusan ini menunjukkan soal selidik tersebut mempunyai nilai kesahan dan kebolehpercayaan bagi mengukur kesemua konstruk dalam konteks tempatan.

Kedua-dua faktor personaliti neurotik dan tekanan menyumbang nilai varian sebanyak 32% untuk kesan kemurungan, manakala faktor personaliti neurotik secara sendirian menyumbang 40% varian untuk kesan tekanan kerja. Walaupun kekuatan pengaruh ini adalah sekitar sederhana berdasarkan kriteria oleh Hair et al. (2011), namun nilai tersebut adalah penting khususnya dalam konteks kajian sains sosial terutamanya kesan tekanan kerja. Ini kerana, melalui satu pembolehubah sahaja sudah boleh meramal pengaruh sehingga 40% tanpa melibatkan faktor-faktor lain yang berkemungkinan boleh

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menyumbang kepada kesan emosi. Oleh itu, faktor personaliti neurotik tidak wajar dipinggirkan apabila merujuk tekanan emosi dalam kalangan pekerja kesihatan.

Perbandingan kekuatan pengaruh setiap faktor berdasarkan saiz pekali regresi dan kesignifikanan mendapati faktor personaliti neurotik mempunyai pekali regresi paling tinggi dan signifikan terhadap tekanan kerja ($\beta = 0.633$). Ini diikuti oleh pengaruh tekanan kerja terhadap kesan kemurungan dengan nilai pekali regresi $\beta = 0.418$ dan signifikan. Sebaliknya faktor personaliti neurotik tidak menyumbang kepada kesan kemurungan berdasarkan nilai pekali regresi tidak signifikan.

Keputusan pengaruh tidak signifikan personaliti neurotik terhadap kemurungan ini berbeza dengan dapatan kajian lepas. Ini kerana, kajian lepas mendapati personaliti neurotik mempunyai pengaruh positif terhadap kemurungan yang signifikan (Gramstad et al., 2013; Hakulinen et al., 2015; Meng Shi et al., 2015). Berdasarkan klasifikasi penyakit oleh WHO (2010), kemurungan adalah sejenis penyakit mental dalam kategori gangguan afektif. Gejala yang dialami pesakit lebih teruk seperti kehilangan minat dan keseronokan serta mengandungi idea untuk bunuh diri (Barlow & Durand, 2009). Sebaliknya, tekanan kerja tidak termasuk dalam klasifikasi WHO sebagai suatu penyakit. Ini bermakna, tekanan kerja tidak tergolong sebagai penyakit mental. Oleh itu, dalam konteks kajian ini, individu dengan tret personaliti neurotik yang tinggi walaupun bersifat beremosi, gelisah, gementar dan emosi yang senang berubah tidak semestinya cenderung untuk mendapat kesan kemurungan. Tekanan adalah keadaan biasa yang boleh dialami oleh semua pekerja walaupun dalam tahap berbeza. Ini menjelaskan penemuan tidak signifikan bagi hubungan personaliti neurotik dengan kesan kemurungan.

Keputusan kajian yang mendapati personaliti neurotik mempunyai pengaruh positif dan signifikan terhadap tekanan kerja adalah selari dengan dapatan kajian lepas (Hudek-Knezevic et al., 2011; Song E. Kim et al., 2016; Panchu et al., 2016; Perez-Fuentes et al., 2019; McManus et al., 2004). Sifat individu dengan tret personaliti neurotik yang tinggi cenderung untuk beremosi, rasa rendah diri, tegang, gelisah dan gementar walaupun berhadapan masalah yang ringan (Panchu et al., 2016). Tugasan sebagai petugas barisan hadapan dalam pengurusan pandemik COVID-19 adalah mencabar kerana lebih mudah untuk menemui masalah yang memerlukan keputusan dan tindakan segera.

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Jadual 4: ***Keputusan Pengujian Peramal Kemurungan***

No.	Hipotesis			Parameter (β)	Bootstrapping CI		Paras Signifikan	Keputusan
					Upper	Lower		
H2	Tekanan	<---	Neurotik	0.633	0.482	0.759	0.001	Sokong
H3	Kemurungan	<---	Tekanan	0.418	0.094	0.758	0.011	Sokong
H4	Kemurungan	<---	Neurotik	0.201	-0.145	0.476	0.207	Tidak Sokong

Jadual 5: ***Keputusan Pengujian Kesan Pengantaraan Faktor Tekanan (Hipotesis 5)***

Parameter (β)		Bootstrapping CI (Indirect)				Paras Signifikan		Keputusan
		Indirect		Direct				
Indirect	Direct	Upper	Lower	Upper	Lower	Indirect	Direct	Sokong
0.265	0.201	0.55	0.068	0.476	-0.145	0.008	0.207	

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Suasana kerja sedemikian menjadi punca kesan tekanan emosi dalam kalangan individu tinggi personaliti neurotik. Apatah lagi, banyak peraturan yang perlu dipatuhi (dan sentiasa berubah) semasa mengendalikan pandemik virus. Menurut Staw dan Cohen-Charash (2005), organisasi yang mempunyai peraturan ketat akan membina satu iklim kerja agar sentiasa mematuhi kehendak organisasi dan mencipta satu budaya kerja keras dan kaku. Oleh itu, tekanan kerja lebih mudah dialami dalam kalangan petugas kesihatan barisan hadapan yang tinggi personaliti neurotik.

Keputusan kajian yang mendapati pengaruh positif dan signifikan tekanan kerja dengan kemurungan juga konsisten dengan keputusan kajian lepas (Moreira & Furegato, 2013; Song E. Kim et al., 2016; Huey-S Lin et al., 2010). Ini disebabkan terdapatnya perkaitan konsep dan teori antara kedua-dua pembolehubah tersebut (Hammen, 2005). Tekanan kerja yang dialami oleh individu dalam masa panjang cenderung untuk mengakibatkan kesan kemurungan. Apatah lagi suasana kerja yang berisiko khususnya semasa menguruskan pandemik virus. Golongan ini juga dikenalpasti sebagai kumpulan pekerja kesihatan yang cenderung untuk mendapat kemurungan (Wong et al., 2010).

Penemuan penting dalam kajian ini ialah faktor tekanan tugas menjadi pengantara yang signifikan bagi pengaruh dimensi personaliti neurotik terhadap kemurungan (pengantaraan penuh). Kesan pengantaraan berfungsi untuk menjelaskan bagaimana suatu pembolehubah bebas (personaliti neurotik) memberi pengaruh kepada pembolehubah terikat (kemurungan). Ini kerana sedikit kajian dilakukan untuk mengetahui kesan pengantaraan oleh faktor tekanan bagi hubungan antara personaliti dengan kemurungan walaupun menurut Klein et al. (2011) secara teori hubungan tersebut boleh terjadi. Sebilangan kecil kajian misalnya kajian oleh Song E. Kim et al. (2016) di negara Korea mendapati tekanan kerja dapat menjadi faktor pengantara bagi pengaruh hanya satu jenis tret personaliti sahaja iaitu neurotik terhadap kemurungan. Oleh itu, keputusan kajian ini menjawab cadangan oleh Klein et al. (2011) agar peranan pengantaraan oleh faktor-faktor lain dikaji oleh pengkaji akan datang.

Walaupun kajian ini mendapati petugas kesihatan barisan hadapan yang tinggi personaliti neurotik tidak cenderung untuk mengalami kemurungan tetapi jika individu tersebut kekal berada dalam suasana tekanan kerja mereka akan mudah mendapat kemurungan. Sebaliknya, jika individu tersebut dapat mengurus keadaan tekanan kerja yang dialami dengan baik maka, keadaan kemurungan tidak akan berlaku. Oleh itu, dapatan ini mempunyai implikasi

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praktikal khususnya peranan pihak pengurusan. Secara umumnya, persekitaran kerja untuk petugas kesihatan barisan hadapan menangani pandemik COVID-19 mempunyai cabaran dan tekanan kerja yang tinggi. Tindakan wajar dilaksanakan bagi mewujudkan suasana kerja yang rendah tekanan seperti penjadualan kerja yang munasabah bagi memastikan petugas mempunyai waktu yang cukup untuk merehatkan fizikal dan mental. Aktiviti promosi bagi mengurangkan tekanan seperti penilaian secara kerap oleh ahli psikologi berkaitan emosi dan tekanan yang dialami juga perlu dijalankan. Seperti dicadangkan oleh Zaka et al. (2020), petugas kesihatan barisan hadapan yang menguruskan pandemik COVID-19 perlu dibantu melalui intervensi psikologikal supaya golongan pekerja ini berupaya menyerap beban tugas semasa tempoh kritikal tersebut. Pemberian ganjaran sebagai pengiktirafan juga boleh dipertimbangkan seperti elaun-elaun khas dan sijil penganugerahan yang sesuai.

Kajian ini dilaksanakan melalui kaedah persampelan bertujuan yang tidak memungkinkan untuk generalisasi kepada semua anggota kesihatan barisan hadapan menangani pandemik COVID-19. Kerangka persampelan juga terbatas untuk hospital KKM di Negeri Sembilan sahaja, sedangkan terdapat fasiliti lain yang turut menguruskan pandemik COVID-19 seperti klinik kesihatan, *COVID-19 Assessment Centre* dan lan-lain. Namun demikian, dapatan dari kajian ini dapat mendedahkan isu asas dalam menguruskan sumber manusia yang terlibat dalam pengawalan pandemik virus. Penemuan kajian ini boleh digunakan oleh pengkaji akan datang untuk mengembangkan lagi perkara-perkara penting bagi menyediakan tenaga barisan hadapan yang berkualiti semasa mengurus pandemik virus.

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COVID-19: GENDER DIFFERENCES IN PERCEIVED SOCIAL ISOLATION AND POST-PANDEMIC SOCIAL ANXIETY AMONG MALAYSIAN UNIVERSITY STUDENTS

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ABSTRACT

COVID-19, an infectious disease caused by severe acute respiratory syndrome, saw its first outbreak in Malaysia in early March 2020. To break the chain of infection, the Malaysian Government declared a Movement Control Order by restricting people's movement and reducing contact among people. The lockdown had led to much social isolation, which could severely impact social anxiety levels. Now that the world is entering the endemic phase of COVID-19, this study examined gender differences in perceived social isolation and post-pandemic social anxiety among Malaysian University students. 125 Malaysian University students were recruited for the study by random selection. The study was done through online survey questionnaires. MANOVA showed that Malaysian University students' social isolation variables and social anxiety levels did not differ between males and females ($p > .173$). However, when speaking in public/talking with people in authority, the females rated a significantly higher social anxiety level ($M = 20.61$, $SD = 5.84$) than males ($M = 17.70$, $SD = 4.11$), [$F (1,123) = 5.13$, $p < .05$]. Besides, multiple hierarchical regression with gender and social isolation variables serving as the regressors and social anxiety dimensions serving as the criterion variables showed that both regressors were not significantly explaining more variances [$\Delta F (4,119) = 1.05$, $p = .387$] in total social anxiety level. However, both regressors significantly explained a tiny 5.3% of the variance in interaction with strangers [$\Delta F (4,119) = 2.79$, $p = .03$]. Results suggested that the degree of social isolation did not affect social anxiety levels, implying that people could have good social networking with people through technology and the internet, even though they were not physically around.

***Keywords**: COVID-19; gender; perceived social isolation; post-pandemic social anxiety*

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ABSTRAK

COVID-19, suatu penyakit berjangkit yang disebabkan oleh sindrom pernafasan akut yang teruk, telah merebak di Malaysia pada awal Mac 2020. Untuk memutuskan rantaian jangkitan, Kerajaan Malaysia telah mengisytiharkan Perintah Kawalan Pergerakan (PKP) bagi menyekat pergerakan orang ramai dan mengurangkan perhubungan antara satu sama lain. Kawalan pergerakan ini telah menyebabkan situasi pengasingan sosial yang boleh mempengaruhi tahap kegelisahan sosial. Memandangkan kini, seluruh dunia memasuki fasa endemik COVID-19, kajian ini meneliti perbezaan jantina dalam menangani pengasingan sosial yang dialami dan kegelisahan sosial pasca-pandemik dalam kalangan pelajar Universiti di Malaysia. Seramai 125 pelajar Universiti di Malaysia yang dipilih secara rawak telah mengambil bahagian dalam kajian ini. Kajian ini dilaksanakan melalui tinjauan soal selidik atas talian. MANOVA menunjukkan bahawa pemboleh ubah pengasingan sosial dan tahap kegelisahan sosial pada pelajar Universiti di Malaysia tiada perbezaan antara lelaki dan wanita ($p > .173$). Namun, ketika bercakap di depan khalayak ramai/bercakap dengan orang yang berkuasa, wanita menilai tahap kegelisahan sosial yang lebih tinggi ($M = 20.61$, $SD = 5.84$), daripada lelaki ($M = 17.70$, $SD = 4.11$), [$F (1,123) = 5.13$, $p < .05$]. Selain itu, regresi hierarki berganda dengan pemboleh ubah jantina dan pengasingan sosial yang berfungsi sebagai regresor dan dimensi kegelisahan sosial yang berfungsi sebagai pembolehubah kriteria menunjukkan bahawa kedua-dua regresor tidak menjelaskan lebih banyak variasi [$\Delta F (4,119) = 1.05$, $p = .387$] dalam jumlah tahap kegelisahan sosial. Walau bagaimanapun, kedua-dua regresor menunjukkan terdapat sedikit perbezaan (5.3%) secara signifikan dalam interaksi dengan orang asing [$\Delta F (4,119) = 2.79$, $p = .03$]. Hasil kajian menunjukkan bahawa tahap pengasingan sosial tidak mempengaruhi tahap kegelisahan sosial, menyarankan bahawa segolongan peserta dapat menguasi jaringan sosial yang baik dengan orang lain melalui teknologi dan internet walaupun mereka tidak bertemu secara fizikal.

***Katakunci**: COVID-19; jantina; pengasingan sosial yang dirasakan; kegelisahan sosial pasca-pandemik*

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1.0 INTRODUCTION

In early March 2020, the Coronavirus Disease 2019 (COVID-19) outbreak was a worrying situation in Malaysia (Hashim et al., 2021). Hence, starting on March 18, 2020, the Malaysian government declared a Movement Control Order (MCO) to break the chain of COVID-19 infection in Malaysia (Hashim et al., 2021; Shah et al., 2020). Due to the COVID-19 cases caused by person-to-person transmission (e.g., Phan et al., 2020; Wu et al., 2020; Zhang et al., 2020) and the precedent from the Chinese government (i.e., the first coronavirus lockdown), the Malaysian government decided to take a similar approach. It implemented MCO to restrict people's movement and practiced social distancing in public. For instance, the Malaysian government had mandated people to practice home isolation and social quarantine to prevent and cut off the spread of the COVID-19 virus within the country.

These strategies implemented by the Malaysian government, limiting the people's movement, would lead to social isolation (Dumitrache et al., 2021; Prowse et al., 2021). Besides, a survey done in the US by Osgood et al. (2021) found that people were experiencing social anxiety due to the COVID-19 pandemic. Moreover, social isolation (loneliness) was also correlated to social anxiety levels (Lim et al., 2016).

Perceived Social Isolation

According to Zavaleta et al. (2017), social isolation was defined as insufficient quality and quantity of social relations with others (e.g., individual, group, community, and social environment) where human interaction took place and a lack of social connectedness (Zavaleta & Samuel, 2014). The quantity of social relations refers to the frequency of human interactions, whereas the quality of social relations refers to the internal satisfaction of human interactions. Wang et al. (2017) also mentioned that social isolation consisted of objective social contact and subjectively perceived adequacy of social connection.

In short, both external and internal social isolation were essential in representing the degree of social isolation. Thus, by measuring people's external social isolation (e.g., social network and frequency of social contact) and internal social isolation (e.g., sense of relatedness and feelings of loneliness), their social isolation degree was measured and interpreted more comprehensively.

During this COVID-19 pandemic era, especially during the MCO period when people's movement had been restricted, the chance of having

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social isolation was found to have been increased (Banerjee & Rai, 2020; Dumitrache et al., 2021; Prowse et al., 2021). Previous researchers (e.g., Kim & Jung, 2021) have revealed that social isolation would lead to poor mental health. Moreover, Peçanha et al. (2020) and Xia and Li (2018) also suggested that long-term social isolation could lead to a higher mortality risk. Liu et al. (2020) also indicated that social isolation and loneliness could have a negative impact on mental health (e.g., depressive symptoms, poor sleep quality, and physical inactivity) (see also Sepúlveda-Loyola et al., 2020).

Previous researchers (e.g., Ausin et al., 2021; Helm et al., 2018; McQuaid et al., 2021) had put a lot of effort into examining the gender effect on social isolation before and during the COVID-19 pandemic. Helm et al. (2018) revealed that males were more socially isolated than females, although there was no significant gender difference in perceived social isolation. Helm et al. (2018) suggested that males were generally more socially isolated than females since males did not make adequate emotional intimacy when they were not physically around (see also Gaia, 2002; Vandervoort, 2000). Besides, females were found to be more likely to participate in social activities (McLaren et al., 2020) and tended to experience fewer feelings of loneliness than males (McQuaid et al., 2021). However, Helm et al. (2018) were done before the COVID-19 pandemic. At that time, there were no regulations restricting people's movement and prohibited physical and social activities (as MCO implemented by the Malaysian government). Hence, studies that were done during and after the COVID-19 pandemic were essential to explore the effect of the pandemic on people's social isolation.

For the previous studies done during the pandemic period, Banerjee et al. (2020) revealed that about 23% of females were experiencing a higher loneliness rate than males during COVID-19. Furthermore, Best et al. (2021) suggested that females were experiencing more psychological distress than males during the pandemic. Females who experienced limited social activities and social distancing were found to have a higher mean of 3.31 in emotional distress than males (mean = 2.76).

Besides, Williams and his colleagues (2020) revealed that the social isolation and social distancing associated with COVID-19 policies had caused a negative impact on mental health and well-being (e.g., loss of motivation) during the UK lockdown. Ausin et al. (2021) also indicated that women were experiencing more feelings of loneliness than men during the COVID-19 pandemic. However, these studies (e.g., Ausin et al., 2021; Banerjee et al., 2020; Best et al., 2021; Williams et al., 2020) were done in Western countries

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(e.g., Spain, the United States, Canada, and the United Kingdom). Thus, research on this aspect was needed in Asian countries (e.g., Malaysia).

Most of the previous studies (e.g., Ausin et al., 2021; Helm et al., 2018) were done before and during the COVID-19 pandemic. A full understanding of the gender effect on social isolation in the post-pandemic era was still scarce and lacking. Hence, the current study intended to fill the research gap by studying the gender effect on social isolation in the post-pandemic era.

Post-pandemic Social Anxiety

Social anxiety was defined as the fear of social situations (e.g., having a conversation with others, meeting strangers) in which people might feel embarrassed and being negatively and unfavorably evaluated (e.g., being seen as stupid) (Kocovski & Endler, 2000; Lake & Arkin, 1985; Leary & Kowalski, 1997). Social anxiety did not only happen in natural social settings. Social anxiety could also happen in an imagined social situation (Leary & Kowalski, 1997). For instance, people might feel socially anxious by imagining a social situation that would happen in a natural setting. When anxiety causes individual distress or impairment in functioning, the person could be diagnosed with social phobia or social anxiety disorder (SAD) (Stein & Stein, 2008).

Social anxiety could be measured and interpreted through different dimensions. For instance, Caballo et al. (2015) proposed an instrument named the Social Anxiety Questionnaire for Adults (SAQ), which was used to measure social anxiety in five dimensions. The first dimension was interaction with strangers (see also Leary & Kowalski, 1997). Goodman & Kashdan (2021) revealed that a person diagnosed with SAD tended to avoid internal and unwanted thoughts or feelings during conversations with strangers, especially when the conversation was related to intimate matters (see also Kashdan et al., 2014).

Next, the second dimension was speaking in public or talking with people in authority. Pollard and Henderson (1988) found that about 20.6% of the prevalence of phobias was related to public speaking. Public self-consciousness could be an antecedent of social anxiety. Although people might not experience discomfort from public self-awareness, some researchers (e.g., Fenigstein, 1974) revealed that women with higher public self-awareness were more sensitive to rejection by a group and less affiliated with the group than women with low public self-awareness. Hence, this might be an antecedent cause of social anxiety.

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The third dimension was interaction with the opposite sex (see also Learky & Kowalski, 1997), known as dating anxiety. Robins (1986) suggested that both females and males might face social difficulties due to opposite-sex interaction. Through the SAQ proposed by Caballo et al. (2015), the aspect of opposite-sex interaction was measured by asking the participants to imagine the social situation in which they had a conversation with the opposite sex or were being watched by the opposite sex.

Then, the fourth dimension proposed by Caballo et al. (2015) was criticism and embarrassment. People might experience social anxiety when afraid of being criticized and fearing embarrassment. Mehtalia and Vankar (2004) found that criticism and embarrassment accounted for 27.8% of the variance in the Social Phobia Inventory (SPIN). Lastly, the fifth dimension was the assertive expression of annoyance, disgust, or displeasure. People could experience social anxiety when expressing their displeasure thoughts and feelings (Wagner et al., 2014).

Nowadays, the world is entering the endemic phase of COVID-19. People started returning to their everyday lifestyles after long social isolation (e.g., MCO). Hence, it would be valuable to look at the effect of the COVID-19 pandemic on social anxiety levels (post-pandemic social anxiety level). A survey done in the US revealed that people were experiencing social anxiety due to the COVID-19 pandemic (Osgood et al., 2021) (see also Blewett & Ebben, 2021; Dodgen-Magee, 2021). Besides, previous research (e.g., Iverach et al., 2017) has shown that socially anxious individuals engaged more in self-focused thinking, leading to impaired social information processing. Hence, people with social anxiety might face difficulties in social settings.

Moreover, Dryman & Heimberg (2018) suggested that people with high social anxiety tended to report fewer positive social events and positive emotions compared to people with low social anxiety, indicating that social anxiety was associated with emotion regulation difficulties (see also Farmer & Kashdan, 2012; Kashdan & Collins, 2010). The right interventions could be provided and improved by better understanding and more insight into the social anxiety phenomenon. For instance, Overcome Social Anxiety – a new web-based cognitive behavioral therapy (CBT) intervention for treating social anxiety symptoms (McCall et al., 2018), and school-based intervention for social anxiety disorder (Felsman et al., 2019; Gee et al., 2020). A right and effective intervention could be implemented for people with social anxiety by better understanding their social anxiety symptoms and phenomena. Olfson et al. (2000) indicated that people often faced treatment barriers when they were

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unsure where to seek help and feared negative thoughts from others. Hence, having more insight into the social anxiety phenomenon could improve the stigma and public awareness of social anxiety.

Previous studies (e.g., Asher et al., 2017; Espinosa et al., 2008) have put in the effort to investigate the gender effect on social anxiety levels. Espinosa et al. (2008) revealed that women were significantly more socially anxious than men in 88.67% of the social situations included in the SAQ-A (Caballo et al., 2010). A systematic review by Asher et al. (2017) also found a similar result that supported Espinosa et al. (2008)'s findings. Asher et al. (2017) revealed that women were more likely to have SAD than men (e.g., Asher & Aderka, 2018; Jalnapurkar et al., 2018; van der Vegt & Kleinberg, 2020).

Moreover, Pierce (2009) researched the effect of technology on social anxiety by comparing face-to-face communication and socially interactive technologies (e.g., online social sites and text messaging). Pierce (2009) found that women felt more socially anxious and not comfortable talking with others face-to-face. Besides, females also self-reported that they felt more comfortable using socially interactive technologies to communicate with others. Hutchins et al. (2021) also found that social anxiety levels were decreased through online interaction for people with high social anxiety levels (see also Yen et al., 2012). However, these previous research works (e.g., Asher et al., 2017; Espinosa et al., 2008; Pierce, 2009; Yen et al., 2012) were done prior to the COVID-19 pandemic.

To investigate how COVID-19 influenced social anxiety, Itani et al. (2021) researched social anxiety among adolescents during the COVID-19 lockdown. Results showed no significant association between gender and severe social anxiety. Besides, Jones et al. (2021) suggested that social distancing in public (one of the COVID-19 policies) had caused a reduction in social anxiety since people had less contact with others. Hawes et al. (2021) found supportive evidence that home confinement had decreased social anxiety symptoms.

These studies (e.g., Itani et al., 2021; Jones et al., 2021) were supported by Pierce's (2009) and Hutchins et al. (2021) studies, which suggested that online interaction led to a decrease in social anxiety levels. Due to the MCO implemented by the Malaysian government, people had practiced home isolation and thus had more time to communicate and interact with people through online technology. However, these studies (e.g., Hawes et al., 2021; Itani et al., 2021) were done mostly among adolescents and during the

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pandemic. Thus, research on this aspect could be extended by investigating post-pandemic social anxiety in adults.

The world is entering the endemic phase, and people started returning to normal life and re-engaging with society. Hence, it was constructive to discover the effect of the COVID-19 pandemic on social anxiety levels in this post-pandemic world. Previous studies done during the pandemic (e.g., Itani et al., 2021) showed reduced social anxiety symptoms due to the lack of face-to-face communication and increased online interaction (Hutchins et al., 2021). But what about post-pandemic?

When people started returning to a normal social lifestyle, they tended to interact more with people in person rather than online. In this case, a question arose: Would the reduced social anxiety symptoms reported by Itani et al. (2021) and Jones et al. (2021) be sustained and brought to daily interactions in the post-pandemic world? According to previous studies before the pandemic (e.g., Asher et al., 2017; Espinosa et al., 2008), people with a normal social lifestyle tended to have greater social anxiety levels among females. However, the effect of the COVID-19 pandemic was unknown in these studies. There was still a lack of research evidence on this aspect; hence, this current study was essential to see the effect of the COVID-19 pandemic on social anxiety levels in the post-pandemic world.

Relationships between perceived social isolation and post-pandemic social anxiety

Lim et al. (2016) investigated how loneliness related to social anxiety. They found that earlier loneliness was positively related to social anxiety in the future, suggesting that loneliness might be a potential antecedent to mental health issues (e.g., social anxiety and depression). Besides, a systematic review by Loades and her colleagues (2020) showed that social anxiety moderately or strongly correlated to social isolation or loneliness.

Moreover, Mak et al. (2018) also found that not just social anxiety would lead to loneliness, but the feelings of loneliness and being emotionally distant from people could lead to social anxiety as well. However, a lack of previous research investigated social isolation and post-pandemic social anxiety. Hence, this current study intends to fill this research gap by examining the relationships between perceived social isolation and post-pandemic social anxiety.

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Current study

Based on previous studies (e.g., Banerjee et al., 2020; Best et al., 2021; Hawes et al., 2021; Itani et al., 2021; Loades et al., 2020; Williams et al., 2020), this current study aims to examine gender's effect on perceived social isolation and post-pandemic social anxiety level as well as, the relationships among gender, perceived social isolation and post-pandemic social anxiety. The perceived social isolation would be measured using four indicators (including both external and internal social isolation measures as mentioned previously): 1) The co-living individuals in the past three months; 2) Social network (LSNS-6 scale - Lubben et al., 2006); 3) Sense of relatedness (modified version of basic psychological needs scale - Zavaleta et al., 2017); 4) Feeling of loneliness (UCLA Loneliness Scale - Russell, 1996). Meanwhile, the post-pandemic social anxiety level will be measured using SAQ (Caballo et al., 2015) to measure the five dimensions of social anxiety and the total social anxiety level.

Three research questions were made in this current study: 1) Does gender difference affect perceived social isolation among Malaysian University students, and to what extent?; 2) Does gender difference affect post-pandemic social anxiety levels among Malaysian University students, and to what extent?; 3) Do relationships exist among gender, perceived social isolation, and post-pandemic social anxiety level?

The rationale of this study was to fill the research gap by targeting Malaysian University students aged 18 or above since most of the other studies were carried out outside of Malaysia (e.g., Ausin et al., 2021; Banerjee et al., 2020; Best et al., 2021; Williams et al., 2020) and most previous studies were targeting on young adolescents (e.g., Hawes et al., 2021; Itani et al., 2021). Besides, as mentioned before, previous studies (e.g., Ausin et al., 2021; Helm et al., 2018) were done before and during the pandemic. Hence, the current study aimed to fill the research gap by studying and exploring the gender effect on social isolation in the post-pandemic era. This study was important to examine how COVID-19 influenced people's perceived social isolation and social anxiety levels. This study also intended to fill the research gap since there was a lack of research investigating the relationship between perceived social isolation and post-pandemic social anxiety.

Based on previous research (e.g., Banerjee et al., 2020; Best et al., 2021; Hawes et al., 2021; Itani et al., 2021; Loades et al., 2020; Williams et al., 2020), three hypotheses have been made in this current study: 1) Females were significantly more socially isolated compared to males; 2) Females had

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significantly greater post-pandemic social anxiety levels than males; 3) The greater the person felt socially isolated, the greater the post-pandemic social anxiety.

This study has been approved by the Science and Engineering Research Ethics Committee (SEREC) from the University of Nottingham Malaysia (ethical approval code: KC251021).

2.0 METHODOLOGY

Design

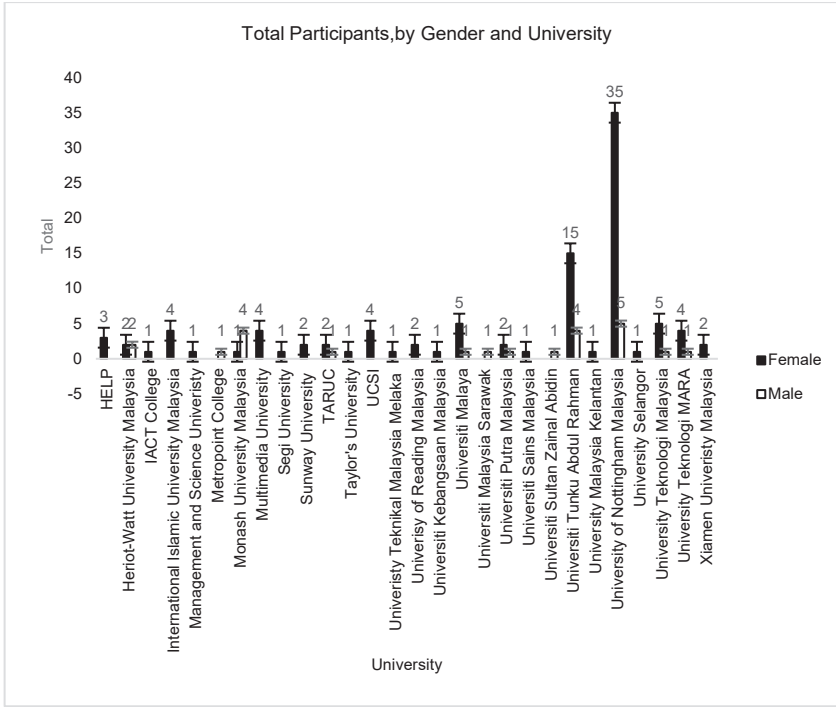
This study was an observational study aimed to examine the gender effect (female & male) on perceived social isolation (variables: co-living individuals in the past three months, social network, sense of relatedness, feeling of loneliness) and post-pandemic social anxiety levels (dimensions: total social anxiety level, interaction with strangers, speaking in public/talking with people in authority, interaction with the opposite sex, criticism, embarrassment, and assertive expression of annoyance, disgust or displeasure) among Malaysian University students (included all the public universities and private universities in Malaysia, for instance, University Malaya, University of Nottingham Malaysia, University Tunku Abdul Rahman and so on) (for more detailed information, refer to Figure 1). All participants took part in the same survey questionnaire. The questionnaire has been adapted to better fit the purpose of this current study (for more detailed information, refer to the Materials & Apparatus).

Participants

A total of 151 responses were collected. Participants, who were Malaysians aged 18 and above, were University students during the time they took part in the survey, thus were eligible to be included in the data analysis. After data screening, 26 responses had been excluded due to incomplete data (16 responses) and did not meet the nationality requirement (10 responses) (i.e., Malaysian). Hence, 125 responses from Malaysian University students (102 Female, 23 Male) (Figure 1), ages ranging from 18 to 37 (M = 21.86, SD = 2.936), were analysed.

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Figure 1: *Total Participants by Gender (Female and Male) and Universities (Help University, University of Nottingham Malaysia, Universiti Malaya and so on).*



Materials & Apparatus

Perceived social isolation

The perceived social isolation was determined using four variables (e.g., co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness). First, the participants self-reported the number of people living under the same roof in the past three months (scale from 0 to 15). The number of people living under the same roof in the past three months was measured to recognize the participants' social contact in the past three months (see also Röhr et al., 2021). The greater number of co-living individuals in the

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past three months indicated that the participants had more significant social contact with people physically in the past three months.

Then, the social network was measured using the Lubben Social Network Scale-6 (LSNS-6) (Lubben et al., 2006). (Sample question: how many relatives have you seen or heard from in the past three months? The scoring: none = 0, one = 1, two = 2, three or four = 3, five through eight = 4, nine or more = 5). The total score range was from 0 to 30, in which a higher score indicated that the participants had better social networks with people. LSNS-6 was used in this study since it demonstrated a solid discriminate validity regarding the measures of living with partners, receiving emotional support, and participating in group activities. Besides, LSNS-6 also demonstrated robust convergent validity, indicating that the scale was highly correlated with the measure of living with a partner, emotional support, and participation in group activities (Lubben et al., 2006).

The third indicator of perceived social isolation - the sense of relatedness, was measured using a modified version of the Basic Psychological Needs Scale (originally from La Guardia et al., 2000) (modified version from Zavaleta et al., 2017). This study asked a sample question: 'I get along well with people I come into contact with' - not at all true = 1, somewhat true = 2, fairly true = 3, completely true = 4. The total score ranged from 3 to 12, with a higher score indicating that the participants considered themselves highly related to the people around them. As Zavaleta et al. (2017) mentioned, the three questions used to measure the sense of relatedness in this study were intended to measure the internal social isolation of the participants.

Lastly, the fourth variable of perceived social isolation was the feeling of loneliness, measured using the UCLA Loneliness Scale (Russell, 1996). This study asked a sample question: How often do you feel you are in tune with the people around you? - never = 1, rarely = 2, sometimes = 3, often = 4. The total score ranged from 8 to 32. A higher score on the UCLA Loneliness Scale indicated that the participants experienced a higher level of loneliness. UCLA Loneliness Scale was chosen to be used in this study since it demonstrated a high test-retest reliability over a year (r = .73) and high internal consistency (coefficient alpha ranging from .89 to .94) (Russell, 1996).

Post-pandemic social anxiety

Post-pandemic social anxiety was measured using the Social Anxiety Questionnaire for Adults (SAQ) (Caballo et al., 2015). Participants were required to rate their stress, nervousness, and unease in different situations.

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One sample question in SAQ that was used in this study was 'having to speak in class, at work, or in a meeting' - not at all or very slight = 1, slight = 2, moderate = 3, high = 4, very high or extremely high = 5. The total score ranged from 30 to 150. Besides, within the SAQ, there were five dimensions of social anxiety being measured: 1) Interactions with strangers (sum of the items 10, 13, 15, 17, 19, & 22); 2) Speaking in public/Talking with people in authority (sum of the items 3, 7, 12, 18, 25, & 29); 3) Interactions with the opposite sex (sum of the items 4, 6, 20, 23, 27, & 30); 4) Criticism and embarrassment (sum of the items 1, 8, 16, 21, 24, & 28); 5) Assertive expression of annoyance, disgust or displeasure (sum of the items 2, 5, 9, 11, 14, & 26)

The higher score in SAQ indicated that the participants had experienced higher post-pandemic social anxiety levels. SAQ was used to measure post-pandemic social anxiety levels in this study as it was a highly reliable instrument. SAQ has been found to have high internal consistency reliability (Cronbach's alpha = .922) for the total scores and moderate to high for the dimensions of SAQ (Cronbach's alpha > .660) (Caballo et al., 2015).

Procedure

At the start of the survey, the participant information sheet and research participant privacy notice were provided to inform the participants regarding the purpose and details of the study, how their data would be handled, and their rights as participants before they decided to participate in this study. Then, a digital consent form was given to ensure voluntary participation, and the participants had well understood how their data would be handled. After getting their consent to participate, the participants were required to fill up their demographic details (i.e., gender, age, nationality, name of university and year of study, whom they stayed with most of the time in the past three months, and the number of people living under the same roof in the past three months).

Then, the participants were required to answer the remaining 47 questions on the perceived social isolation (LSNS-6 scale, a modified version of the basic psychological needs scale and UCLA Loneliness Scale - as mentioned in Materials & Apparatus) and post-pandemic social anxiety (SAQ) (full version of questionnaire refer to Appendix A).

After answering all 54 questions, a debrief was given, including the study's purpose and hypotheses and how they were tested. The survey would take approximately 10 to 15 minutes to complete. The data collected was anonymous and would be kept strictly confidential in a database that would be password protected.

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3.0 RESULTS

For females and males, the mean of social isolation variables (e.g., co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness) were calculated (Figure 2). In addition, the mean of social anxiety dimensions (e.g., interaction with strangers, speaking in public/talking with people in authority, interaction with the opposite sex, criticism, embarrassment, and assertive expression of annoyance, disgust, or displeasure) were also calculated for both genders (Figure 3). The mean of total social anxiety levels for both genders is shown in Figure 4.

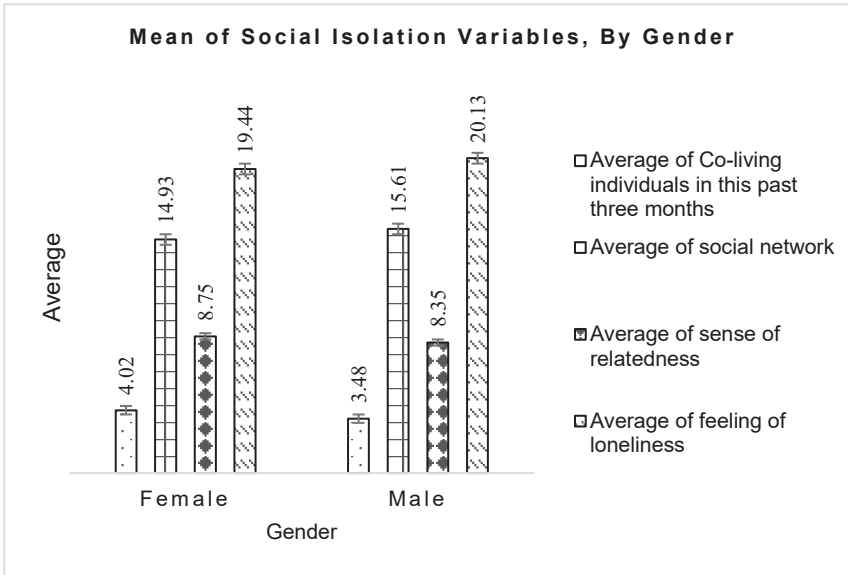


Figure 2: *Mean of Social Isolation Variables (e.g., co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness) by Gender*

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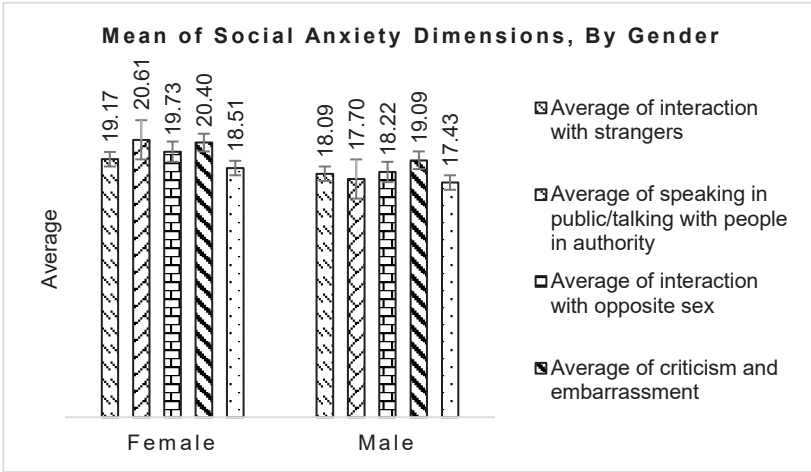


Figure 3: *Mean of Social Anxiety Dimensions (e.g., interaction with strangers, speaking in public/talking with people in authority, interaction with the opposite sex, criticism and embarrassment, and assertive expression of annoyance, disgust, or displeasure) by Gender.*

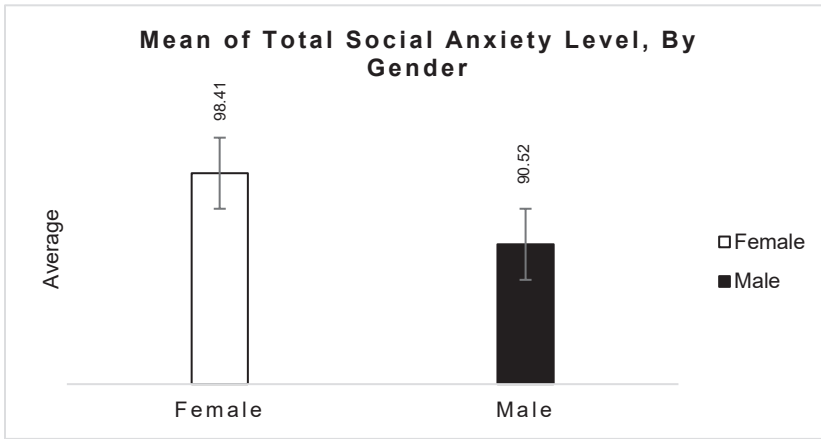


Figure 4**:** *Mean of Total Social Anxiety Level, by Gender.*

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MANOVA

MANOVA was used to examine the effect of gender (female and male) on social isolation variables (e.g., co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness) and social anxiety dimensions (e.g., total social anxiety level, interaction with strangers, speaking in public/talking with people in authority, interaction with the opposite sex, criticism and embarrassment, and assertive expression of annoyance, disgust or displeasure).

Results found that gender did not differ significantly among the co-living individuals in the past three months (p = .237), social network (p = .504), sense of relatedness (p = .392), a feeling of loneliness (p = .476), total social anxiety level (p = .173), interaction with strangers (p = .371), interaction with the opposite sex (p = .312), criticism and embarrassment (p = .314), and assertive expression of annoyance, disgust or displeasure (p = .421). The social isolation variables and social anxiety levels in Malaysian University students did not differ significantly on gender. However, only one variable, which was speaking in public/talking with people in authority, was found to have a significant gender effect, F (1,123) = 5.13, $p < .05$, which indicated that females had higher social anxiety levels in terms of speaking in public or talking with people in authority (M = 20.61, SD = 5.84), as compared to male (M = 17.70, SD = 4.11). The Pillai's Trace indicated no evidence of a significant effect (p = .222).

Multiple hierarchical regression

To examine the relationship between the two regressors, gender (regressor 1) and perceived social isolation (regressor 2), and social anxiety dimensions, six multiple hierarchical regressions were done with six social anxiety dimensions (i.e., total social anxiety level, interaction with strangers, speaking in public/talking with people in authority, interaction with the opposite sex, criticism and embarrassment, and assertive expression of annoyance, disgust or displeasure). All regression models were not significant except for the dimension of interaction with strangers and speaking in public/talking with people in authority.

Criterion variable: Interaction with strangers

A hierarchical multiple linear regression was conducted with interaction with strangers as the criterion variable, and gender (female and male) and the social isolation variables (e.g., co-living individuals in the past three months, social

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network, sense of relatedness, and feeling of loneliness) as the predictor variables. Two models were used: 1) Gender; 2) Gender and the social isolation variables.

There was no evidence of multi-collinearity or singularity in the predictor variable (*r*'s < .9 for all pairs of variables and all tolerances > .1). No substantial outliers were detected (standardized residual = 2.25), residual errors were normally distributed, and homoscedastic was assumed.

Model 1, based only on gender, did not significantly explain the interaction variance with strangers [F (1,123) = .81, p = .371]. Model 2, adding the co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness as predictors explained significantly 5.3% of variance [ΔF (4,119) = 2.79, p = .03] in the interaction with strangers.

Table 1: ***Summary Statistics for Each of the Two Multiple Linear Regression Models.***

	R^2	ΔR^2	R^2_{adj}	F	$p(F)$	ΔF	$p(\Delta F)$
Model 1	.01	.01	-.002	.81	.371	.81	.371
Model 2	.09	.09	.05	2.40	.041	2.79	<.05

Table 2: ***Coefficients, t-values, and p-values for variables that were included in Model 2****.*

Variables	***B***	***t***	***P***
Gender	-1.26	-1.06	.292
Co-living individuals in the past three months	-.18	-.78	.440
Social network	-.16	-1.27	.207
Sense of relatedness	-.29	-1.09	.277
Feeling of loneliness	.12	.84	.401

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Criterion variable: Speaking in public/talking with people in authority

A hierarchical multiple linear regression was conducted with speaking in public or talking with people in authority as the criterion variable, and gender (female and male) and the social isolation variables (e.g., co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness) as the predictor variables. Two models were used: 1) Gender; 2) Gender and the social isolation variables.

There was no evidence of multi-collinearity or singularity in the predictor variable (*r*'s < .9 for all pairs of variables and all tolerances > .1). No substantial outliers were detected (standardized residual = 1.90), residual errors were normally distributed, and homoscedastic was assumed.

Model 1, based only on gender, significantly explained 3.2% of the variance in the aspect of speaking in public/talking with people in authority [F (1,123) = 5.13, p = .025]. Model 2, adding the co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness as predictors did not explain the variance significantly [ΔF (4,119) = 1.14, p = .341] in the aspect of speaking in public/talking with people in authority.

Overall, gender and social isolation variables (e.g., co-living individuals in the past three months, social network, sense of relatedness, and feeling of loneliness) did not significantly explain the variance of total social anxiety level (p = .387), the aspects of speaking in public/talking with people in authority (p = .341), interaction with the opposite sex (p = .784), criticism and embarrassment (p = .372), assertive expression of annoyance, disgust or displeasure (p = .95). However, gender significantly explained a small 3.2% of the variance in the aspect of speaking in public/talking with people in authority (p = .025). In addition, gender and social isolation variables significantly explained a small 5.3% of the variance in the aspect of interaction with strangers (p = .03).

Table 3: ***Summary Statistics for Each of the Two Multiple Linear Regression Models.***

	R^2	ΔR^2	R^2_{adj}	F	$p(F)$	ΔF	$p(\Delta F)$
Model 1	.04	.04	.03	5.13	<.05	5.13	<.05
Model 2	.08	.04	.04	1.94	.092	1.14	.341

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Table 4: ***Coefficients, t-values, and p-values for variables that were included in Model 2.***

Variables	*B*	*t*	*P*
Gender	-3.19	-2.44	<.05
Co-living individuals in the past three months	-.07	-.27	.788
Social network	.02	.12	.908
Sense of relatedness	-.45	-1.55	.124
Feeling of loneliness	.08	.51	.61

4.0 DISCUSSION

As outlined previously, this study has made three hypotheses: 1) Females were significantly more socially isolated compared to males; 2) Females had significantly greater post-pandemic social anxiety levels compared to males; 3) The greater the person felt socially isolated, the greater the post-pandemic social anxiety.

This current study found that the mean average of perceived social isolation variables for females was higher than for males in the aspects of the co-living individuals and sense of relatedness in the past three months. Meanwhile, males were found to have a higher average on social networks and feelings of loneliness. The results shown in Figure 1 show that females were generally lower in perceived social isolation than males.

However, these differences between males and females in the four perceived social isolation variables (e.g., co-living individuals in the past three months, social networks, sense of relatedness, and feeling of loneliness) were found to be not significant. These findings were quite surprising since it was not supported by the previous studies done during the COVID-19 pandemic (e.g., Ausin et al., 2021; Banerjee et al., 2020; Best et al., 2020), which revealed that females were experiencing more feelings of loneliness than males in the COVID-19 circumstances. These findings were supported and could be explained by McQuaid et al. (2021), who suggested that females tended to experience lesser feelings of loneliness than males.

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Aside from the aforementioned, this study found a similar result to Helm et al. (2018), which revealed that there are no significant gender differences in perceived social isolation. However, the result showed that males were more socially isolated than females. These gender differences revealed by Helm et al. (2018) and the current study could be explained by Gaia (2002) and Vandervoort (2000), who suggested that males were not making emotional intimacy when they were not physically around. Hence, males would perceive greater social isolation than females.

These non-significant findings lack of the evidence to support the first hypothesis due to the different cultural contexts. Most previous studies (e.g., Ausin et al., 2021; Banerjee et al., 2021) were done in Western countries, while the current study focused on Malaysians living in a multi-cultural and collectivistic country. Cultural contexts have been found to influence feelings of loneliness (one of the perceived social isolation variables). Barreto et al. (2021) revealed the cultural differences in loneliness, which showed that individualists reported greater loneliness than collectivists. Heu et al. (2021) further explained these cultural differences by suggesting that collectivistic culture, which was tighter and more restrictive about social relations, tended to have greater perceived social isolation (see also Hussein, 2020). Thus, these no-gender difference findings were not supported by most of the previous studies done during the pandemic (e.g, Ausin et al., 2021), which could be due to the local cultural contexts (current study targeted collectivists – Malaysians).

Overall, the current findings did not support the first hypothesis, which found no significant gender differences in perceived social isolation. Then, this current study found that the average total social anxiety level and for the five dimensions of social anxiety (interactions with strangers, speaking in public/talking with people in authority, interactions with the opposite sex, criticism and embarrassment, assertive expression of annoyance, disgust or displeasure) were higher in females (as shown in Figure 2 and Figure 3). However, these gender differences were not significant based on the MANOVA analysis. Only one variable, which was speaking in public or talking with people in authority, was found to have significant gender differences. This finding was found in the multiple regression analysis as well. Gender was found to have significantly explained a small 3.2% of the variance when speaking in public or talking to people in authority.

The previous studies did not strongly support these results (e.g., Espinosa et al., 2008), which found significant gender differences in social anxiety - females were more socially anxious than males. Although the current

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findings showed that females had higher post-pandemic social anxiety than males, which was supported by most previous studies (e.g., Asher et al., 2017; Asher & Aderka, 2018; Jalnapurkar et al., 2018; van der Vegt & Kleinberg, 2020), overall non-significant gender differences were found on social anxiety except for the aspect of speaking in public. These non-significant gender differences were found by Itani et al. (2021), who suggested no significant association between gender and severe social anxiety as well.

The small (explained by 3.2 % of the variance) but significant gender differences in speaking in public were found by Caballo et al. (2014). The gender differences in public speaking were confirmed by De Paola et al. (2021), who demonstrated that females were more likely to avoid public speaking (Dialan & Almigo, 2021) and demonstrated higher anxiety patterns than males (Barzilay et al., 2020; Perveen et al., 2018). According to De Paola et al. (2021), women's intentions to avoid public speaking and demonstrate higher anxiety patterns might be caused by the gender norms in many domains, such as marriage and the labor market (see also Cunningham et al., 2005).

The non-significant findings for the other aspects, such as interaction with the opposite sex, criticism, and embarrassment, interaction with strangers, and assertive expression of annoyance, disgust, or displeasure, might be affected by other factors, such as attachment style (Manning et al., 2017). Manning et al. (2017) suggested that avoidant people tended to have little interaction with the opposite sex and strangers. Thus, avoidant people might feel more socially anxious in those social situations (see also Feeney et al., 1993).

Besides, the lack of evidence to support the second hypothesis may also be attributed to the local cultural contexts and the time spent conducting this study. Previous studies were done outside Malaysia, mostly in individualistic countries such as America (Espinosa et al., 2008) and before the COVID-19 pandemic (Asher et al., 2017). The cultural differences (collectivists vs. individualists) influenced social anxiety. East Asian people displayed greater social anxiety than Western Europeans (Krieg & Xu, 2018; Krieg et al., 2019; Schreier et al., 2010; Woody et al., 2015).

Thus, these findings provided further insight into the post-pandemic social anxiety among Malaysians. The recent results did not strongly support the second hypothesis, which found a small but significant gender difference in one aspect, speaking in public or talking with people in authority only, and non-significant results for the remaining elements.

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Next, this current study found that perceived social isolation did not predict the variance of post-pandemic social anxiety, suggesting that the perceived social isolation variables (e.g., co-living individuals in the past three months, social networks, sense of relatedness, and feeling of loneliness) did not explain significantly much variance of total social anxiety levels, the aspects of speaking in public, interaction with the opposite sex, criticism and embarrassment, and assertive expression of annoyance, disgust or displeasure. However, only a small (explained 5.3% of the variance) but significant result was found in the aspect of interaction with strangers. This finding indicated that gender and perceived social isolation variables accounted for 5.3 % of the variance in interaction with strangers.

Previous studies did not support these findings (e.g., Lim et al., 2006; Loades et al., 2020; Mak et al., 2018), which found relationships between social anxiety and feelings of loneliness or social isolation. Besides, O'Day and Heimberg (2021) also suggested that socially anxious people wanted to have social contact with others and social networks with people close to them (Porter & Chambless, 2017) (see also Davila & Beck, 2002). However, the current findings indicated that there were no relationships between gender, perceived social isolation and post-pandemic social anxiety. This lack of evidence might be due to the cultural differences mentioned before (e.g., Barreto et al., 2021; Heu et al., 2021; Krieg & Xu, 2018; Krieg et al., 2019; Schreier et al., 2010; Woody et al., 2015). Thus, this current study also provided further insight by examining Malaysians (people from a multi-cultural and collectivistic country).

Overall, the third hypothesis was not supported by the current findings, which showed no relationships between the perceived social isolation variables and post-pandemic social anxiety dimensions, except for the interaction with strangers.

This current study aims to improve the understanding of the perceived social isolation and post-pandemic social anxiety among Malaysian university students. Since most of the previous studies were done before the COVID-19 pandemic (e.g., Espinosa et al., 2008; Helm et al., 2018), outside of Malaysia (e.g., Ausin et al., 2021; Banerjee et al., 2020; Best et al., 2021; Williams et al., 2020), and focused on young adolescent (e.g., Hawes et al., 2021; Itani et al., 2021), this current study was implied to extend the findings and understanding by targeting on Malaysian university students aged 18 or above and focused on the post COVID-19 pandemic period.

Based on the results found in the current study, they could be related to previous studies (e.g., Helm et al., 2018; McQuaid et al., 2021). For instance,

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this current study found that males were more socially isolated than females, although the gender differences were non-significant. These findings confirmed the idea suggested by Helm et al. (2018), who said that males did not make adequate emotional intimacy when they were not physically around.

This study was also implied to benefit the community. Based on previous studies (e.g., Kim & Jung, 2021; Peçanha et al., 2020; Xia & Li, 2018), long-term social isolation could lead to poor mental health and increased mortality risk. Loneliness and social isolation could lead to mental health issues (e.g., depressive symptoms and poor sleep quality) (Liu et al., 2020; Sepúlveda-Loyola et al., 2020). Hence, this study could extend a deeper understanding for the effect of the COVID-19 pandemic on perceived social isolation among Malaysian university students. Besides, some researchers (e.g., Cauberghe et al., 2021) also found that young adolescents used technology and the internet to cope with feelings of loneliness and anxiety. Hence, the improvement approaches to cope with perceived social isolation could be developed by exploring further the effect of the COVID-19 pandemic on perceived social isolation.

Besides, this study also implied a further understanding of post-pandemic social anxiety. Iverach et al. (2017) mentioned that socially anxious individuals engaged more in self-focused thinking, leading to impairment in processing social information (see also Hope et al., 1990). Hence, people who experience social anxiety could face difficulties in social settings, affecting their daily social activities. According to Dryman & Heimberg (2018), people with high social anxiety tended to face emotion regulation difficulties and report fewer positive social events and positive emotions as compared to people with low social anxiety (see Farmer & Kashdan, 2012). Hence, this study was beneficial in developing further insight into the effect of the COVID-19 pandemic on social anxiety among Malaysian university students.

Moreover, from this study, future research could be done by considering other factors (e.g., technology and the internet). Previous studies (e.g., Cauberghe et al., 2021; Hutchins et al., 2021; Yen et al., 2012) revealed that online interaction could be a good intervention for social anxiety. Besides, future research could recruit female and male participants in the same ratio to avoid deviation results.

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5.0 LIMITATIONS

Some limitations have been identified in this study and could be considered in future research. First, the ratio of gender recruited in this study was relatively unbalanced. The number of female participants was 102, whereas the male participants were just 23. This imbalance might be a possible cause that results in inaccurate findings. Second, the data collection period was also a possible factor that might affect the result. Since the data collection was started from December 2021 until February 2022, people had begun returning to a normal lifestyle (e.g., the Malaysian government had relaxed the COVID-19 restrictions) and people who had been fully vaccinated could go anywhere by wearing masks and scanning the Mysejahtera application. Most universities had also reopened by that time, and most university students had returned to campus. Thus, people might find it difficult to recall the feelings they experienced during the past three months.

Besides, previous online social networking could be considered since people nowadays spend lots of time on social media, especially during the lockdown period (Cauberghe et al., 2021). Therefore, they might still have sufficient social contact and good social networking. Moreover, all instruments used in this study were self-reported measures. Therefore, the responses collected might be subjective and biased. Although time-consuming, a structured or semi-structured interview could be a good data collection method.

6.0 CONCLUSION

To conclude, the three hypotheses were not supported by the current findings. The current study found no significant gender differences in perceived social isolation and post-pandemic social anxiety and no relationships between perceived social isolation variables and post-pandemic social anxiety variables, except for the interaction with strangers (a small 5.3 % variance). However, this study identified some limitations: an unbalanced number of participants for females and males, a data collection period, good social networking due to technology and the internet as well as self-reported measures. The study also implied extending and exploring a further understanding of the effect of the COVID-19 pandemic and gender differences on perceived social isolation and post-pandemic social anxiety, targeting Malaysian university students.

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APPENDICES

Appendix A.

A Full Version of the Questionnaire Used in the Study, Including Demographic Details, Perceived Social Isolation Variables, and Social Anxiety Questionnaire.

Demographic details

1. Age
2. Gender - Male, Female
3. Nationality - Malaysian, Non-Malaysian
4. Which university are you from?
5. Which year of study are you currently in? - Foundation, UG year 1, UG year 2, UG year 3, UG year 4, Postgraduate, Others
6. Who do you stay with (most of the time) in the past three months? - alone, family member(s), friend(s)
7. How many people lived with you under the same roof these past three months? (score range 0 to 15)

Lubben Social Network Scale - 6 (LSNS - 6)

FAMILY: Considering the people to whom you are related by birth, marriage, adoption, etc…
a. How many relatives do you see or hear from in the past three months?
b. How many relatives do you feel at ease with that you can talk about private matters?
c. How many relatives do you feel close to such that you could call on them for help?

FRIENDSHIPS: Consider all your friends, including those in your neighbourhood.

a. How many of your friends have you seen or heard from in the past three months?
b. How many friends do you feel at ease with that you can talk about private matters?
c. How many friends do you feel close to such that you could call on them for help?

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Scoring: None = 0, One = 1, Two = 2, Three or four = 3, Five thru eight = 4, Nine or more = 5

Sense of Relatedness (modified version of basic psychological needs scale)

How true are the following statements for you in the past three months?

a. I get along well with people I come into contact with.
b. I consider myself close to the people I regularly interact with.
c. People in my life care about me.

Scoring: Not at all true = 1, Somewhat true = 2, Fair true = 3, Completely true = 4.

UCLA Loneliness Scale

Indicate how often you feel the way described in each of the following statements.

a. How often do you feel that you are 'in tune' with the people around you?
b. How often do you feel that no one really knows you well?
c. How often do you feel you can find companionship when you want it?
d. How often do you feel that people are around you but not with you?
e. How often do you feel you are no longer close to anyone?
f. How often do you feel left out?
g. How often do you feel isolated from others?
h. How often do you feel that there are people who understand you?

Scoring: Never = 1, Rarely = 2, Sometimes = 3, Often = 4

Reverse scoring: a, c, h

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Social Anxiety Questionnaire (SAQ)

i. Below are a series of social situations that may or may not cause you UNEASE, STRESS OR NERVOUSNESS.

ii. If you have never experienced the situation described, please imagine what your level of UNEASE, STRESS, OR NERVOUSNESS might be if you were in that situation.

iii. Please rate all the items that best reflect your level of UNEASE, STRESS, OR NERVOUSNESS and do so honestly; do not worry about your answer because there are no right or wrong answers.

1. Greeting someone and being ignored
2. Having to ask a neighbour to stop making noise
3. Speaking in public
4. Asking someone attractive of the opposite sex for a date
5. Complaining to the waiter about my food
6. Feeling watched by people of the opposite sex
7. Participating in a meeting with people in authority
8. Talking to someone who isn't paying attention to what I am saying
9. Refusing when asked to do something I don't like doing
10. Making new friends
11. Telling someone that they have hurt my feelings
12. Having to speak in class, at work, or in a meeting
13. Maintaining a conversation with someone I've just met
14. Expressing my annoyance to someone that is picking on me
15. Greeting each person at a social meeting when I don't know most of them
16. Being teased in public
17. Talking to people I don't know at a party or a meeting
18. Being asked a question in class by the teacher or by a superior in a meeting
19. Looking into the eyes of someone I have just met while we are talking
20. Being asked out by a person I am attracted to
21. Making a mistake in front of other people
22. Attending a social event where I know only one person
23. Starting a conversation with someone of the opposite sex that I like

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24. Being reprimanded about something I have done wrong
25. While having dinner with colleagues, classmates or workmates, being asked to speak on behalf of the entire group
26. Telling someone that their behaviour bothers me and asking them to stop
27. Asking someone I find attractive to dance
28. Being criticized
29. Talking to a superior or a person in authority
30. Telling someone I am attracted to that I would like to get to know them better

*Scoring: Not at all or very slight = 1, Slight = 2, Moderate = 3, High = 4, Very high or extremely high = 5 *

Dimension 1: Interactions with strangers (sum of the items 10, 13, 15, 17, 19, & 22)

Dimension 2: Speaking in public/Talking with people in authority (sum of the items 3, 7, 12, 18, 25, & 29)

Dimension 3: Interactions with the opposite sex (sum of the items 4, 6, 20, 23, 27, & 30)

Dimension 4: Criticism and embarrassment (sum of the items 1, 8, 16, 21, 24, & 28)

Dimension 5: Assertive expression of annoyance, disgust or displeasure (sum of the items 2, 5, 9, 11, 14, & 26)

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THE MULTICOMPONENT HEALTHY WORKER PROGRAMME FOR WEIGHT MANAGEMENT AMONG MALAYSIAN WORKERS

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ABSTRACT

A sedentary lifestyle and unhealthy diets contribute towards obesity and increase risks for early development of non-communicable diseases. Workplace health promotion is important to combat obesity among adults. This study aimed to evaluate the Healthy Worker Programme in reducing weight and its effects on physical activity (PA), dietary intake, and quality of working life (QOWL). The study also assessed the short-term sustainability of these effects. The 6-month Healthy Worker Programme was a quasi-experimental study with multicomponent dietary and PA interventions for overweight and obese workers. The programme, which included environmental modification, top management support, as well as co-worker and individual motivation, was carried out at a worksite and compared to controls at another worksite. Weight, PA, and QOWL were assessed at baseline, mid-programme, and programme end. Energy and nutrient intake were also assessed at baseline and the programme end. The sustainability of health changes was assessed three months after the programme ended. Process evaluation was undertaken quantitatively and qualitatively. A total of 183 participants' data (93 interventions, 90 controls) were analysed. At the programme end, significantly more in the intervention group (14%) lost at least five percent of their original weight compared to controls (4%). For sustainability of weight changes post-programme, 12% of the intervention group and 8% of controls had at least five percent weight loss. PA and QOWL were found to continue improving post-programme. Barriers to changing to a healthier lifestyle were environmental,

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psychological, health conditions, and a lack of understanding of healthy eating habits. The Healthy Worker Programme can be used to promote weight management among workers. It may also improve workers' PA and QOWL. The programme was sustainable for weight management in the short term and could potentially reduce the risks of developing obesity-related chronic diseases.

Keywords: *obesity, work, physical activity, diet, quality of working life*

ABSTRAK

Gaya hidup sedentari dan pemakanan kurang sihat menyumbang ke arah masalah obesiti dan kemunculan awal penyakit-penyakit tidak berjangkit. Promosi kesihatan di tempat kerja adalah penting untuk mengawal masalah obesiti. Objektif penyelidikan ini adalah untuk menilai Program Pekerja Sihat bagi mengurangkan berat badan serta kesannya kepada aktiviti fizikal, pemakanan dan kualiti kehidupan berkaitan pekerjaan. Kajian ini juga menilai kesan berpanjangan dalam jangka masa pendek (short-term sustainablity). Program enam bulan ini ialah penyelidikan kuasi-eksperimental yang mempunyai beberapa komponen intervensi pemakanan dan aktiviti fizikal untuk pekerja-pekerja yang berlebihan berat badan dan obes. Program ini yang merangkumi modifikasi persekitaran, sokongan pihak atasan dan motivasi individu serta rakan sekerja, telah dijalankan di sebuah tempat kerja dan dibandingkan dengan tempat kerja lain sebagai kawalan. Berat badan, aktiviti fizikal dan kualiti kehidupan berkaitan pekerjaan dinilai sebelum, di pertengahan dan akhir program. Jumlah pengambilan kalori dan nutrien turut dinilai sebelum dan selepas program dijalankan. Kesan terhadap kesihatan dinilai pada tiga bulan setelah program berakhir (pasca-program) untuk melihat samada kesan ini berpanjangan (sustainable). Penilaian proses dijalankan secara kuantitatif serta kualitatif. Sebanyak 183 data peserta (93 intervensi, 90 kawalan) telah dianalisa. Pada akhir program, terdapat lebih peserta dalam kumpulan intervensi (14%) yang berjaya menurunkan berat badan asal sekurang-kurangnya 5%, berbanding dengan peserta kawalan (4%). Semasa pasca-program, 12% peserta program, berbanding 8% peserta kawalan telah menurunkan berat badan asal sebanyak sekurang-kurangnya 5%. Aktiviti fizikal dan kualiti kehidupan berkaitan pekerjaan juga meningkat semasa pasca-program. Halangan untuk berubah ke arah gaya hidup sihat terdiri

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daripada faktor-faktor persekitaran, psikologi, kesihatan dan kekurangan pemahaman tentang amalan pemakanan sihat. Program ini boleh digunakan untuk menggalakkan pengurangan berat badan dalam kalangan pekerja dan mungkin boleh mempertingkat aktiviti fizikal dan kualiti kehidupan berkaitan pekerjaan. Program Pekerja Sihat menunjukkan kesan yang berpanjangan dalam pengurusan berat badan dalam jangka masa pendek dan mempunyai potensi untuk mengurangkan risiko penyakit kronik yang berkaitan dengan obesiti.

Kata kunci: *obesiti, kerja, aktiviti fizikal, diet, kualiti kehidupan pekerjaan*

1.0 INTRODUCTION

Being overweight and obese is an excess accumulation of fat which may impair health. Globally, an estimated 2.8 million people die annually from obesity-related causes (WHO, 2021a). Being overweight or obese is a risk factor for non-communicable diseases such as cardiovascular diseases, diabetes, and cancer. The fundamental cause of increased weight in individuals is an energy imbalance between the quantity of calories consumed and energy used by the body for daily activities. In many countries, there has been more energy intake through foods high in fat and calories. There is also more physical inactivity due to a more sedentary lifestyle as a result of changes in the way we work, transportation, and urbanization (WHO, 2021b). Malaysia also faces an increasing trend of overweight and obesity prevalence. The National Health and Morbidity Survey (2019), found that 66% of Malaysian adults were overweight or obese, based on the Malaysian Clinical Practice Guidelines 2004 (MOH, 2004). The survey also reported that 25% of Malaysians aged 16 years and above were physically inactive (IPH, 2020).

Adults spend about half of their waking hours at work, and the worksite is deemed a good environment that provides opportunities to address the overweight and obesity problem by promoting healthy behaviour (Borak et al., 2011). The World Health Organization (WHO) Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020 called for a 10% reduction in physical inactivity by 2025 (WHO, 2018). Workplace physical activity (PA) interventions can help workers reduce weight (Miller et al., 2015; Mulchandani et al., 2019). Dietary and PA workplace interventions, especially those that included changes to the physical work environment and

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organizational structure, reported positive work-related outcomes such as workability, productivity, work performance, and absenteeism (Grimani, Aboagye & Kwak, 2019). However, there appears to be a lack of studies observing the quality of working life (QOWL) with such workplace interventions.

In Malaysia, some initiatives have been taken to promote health at the worksite. Such initiatives among obese workers included PA and/or dietary intake interventions as well as reported weight loss and improvements in diet and quality of life (Appukutty et al., 2014; Jamal et al., 2016; Rusali et al., 2016; Rusali et al., 2018; Tan et al., 2017). However, these efforts are still minimal, not well-sustained or comprehensive, and can be further improved (Tan et al., 2017). There is also a lack of published Malaysian studies combining PA and dietary intervention components (Ahmad et al., 2018). An effective workplace health programme that could improve overweight/obese workers' PA and dietary intake, reduce their weight, and positively impact QOWL would be useful to curb the obesity problem while being beneficial for the work organization. In this study, the six-month, multicomponent Healthy Worker Programme, which targeted overweight and obese Malaysian workers, was evaluated.

2.0 METHODOLOGY

Study participants and setting

In this 9-month quasi-experimental study, a government worksite in the Federal Territory of Kuala Lumpur was the intervention site, while another in the Federal Territory of Putrajaya was the control. The worksite in Kuala Lumpur was chosen for intervention as it was nearer to travel to implement the programme. The worksites have similar work environments and a cafeteria. Both have a gym, staircases, parks, and paths surrounding the office buildings, allowing staff to be physically active. At both sites, the main nature of work was office-based; however, support staff who perform general work were also included in the study. The worksites were an hour's drive away from each other to reduce contamination bias.

The 6-month Healthy Worker Programme at the intervention site promoted improvement in diets and PA. The study's general objective was to evaluate the programme which targeted overweight and obese workers. Specific objectives were determining the programme's effectiveness in reducing weight and improving PA, dietary intake, and QOWL. The hypothesis was participants in the Healthy Worker Programme would have more weight

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reduction and improved PA, dietary intake, and QOWL compared to a control group.

The sample size was calculated using the PS–Power and Size Calculation software based on reducing body mass index (BMI) as an effect of PA and dietary intake workplace intervention. A difference in BMI of as much as -0.5 kg/m^2 between intervention and control groups was referred to (Maruyama et al., 2010). The significant level was set at 0.05, and the power of the study was 80% (McCrum-Gardner, 2010). The ratio of intervention to control participants was 1:1. Sample size was calculated to be 64 participants for the intervention group and 64 controls. This was inflated in case of a drop-out rate of 50%, giving a new sample size of 128 intervention participants and 128 controls.

The human resource departments sent emails and letters to invite staff to join a health screening at the site to recruit participants. Health screenings were conducted by nurses (unaware of the intervention). Employees who fulfilled the inclusion criteria were invited to participate. Voluntary participation was chosen to minimize disruptions to workers and their schedules during the study.

The Physical Activity Readiness Questionnaire (PAR-Q) was used to screen whether participants could participate in PA interventions such as walking. The PAR-Q was adopted in this study and has been used widely worldwide (Warburton et al., 2011). Blood pressure was recorded using an automatic blood pressure monitor (Sem-1 Model, Omron Healthcare Co., Ltd., Kyoto, Japan). For fasting blood glucose and cholesterol level screening, finger prick samples were taken and analysed with a CardioChek lipid and glucose analyser (Polymer Technology Systems, Inc., Indianapolis, U.S.). A physician screened workers for illnesses and assessed if they could participate. Those with abnormal results were referred to a government clinic for follow-up and management. Overweight and obese workers with a BMI of 23 kg/m^2 or more were invited to participate in the study (MOH, 2004). Exclusion criteria were pregnancy, medical conditions that precluded moderate exercise and affected walking (e.g., severe osteoarthritis of the knee, unstable angina, acute injury to lower limbs), ceasing to work at the study site, or unwillingness to participate. Written consent was obtained from all participants. Workers could opt out of the study at any time.

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Intervention

The Healthy Worker Programme was based on the Socio-Ecological Model (McLeroy et al., 1988) and delivered intervention at the intrapersonal, interpersonal, and organizational (workplace environment) levels. At the intrapersonal level, health promotional information packs were sent monthly to participants. Table 1 shows the topics covered in the information packs, including pre-tested printed material by the Ministry of Health (MOH, 2011a). At mid-programme (3rd month), a nutritionist called participants to inform them if they had any improvements in PA or weight changes. During the brief call, participants were given more motivation to improve further or maintain activity levels and eat healthily. Calls were made during office hours and in the evenings up till 6 p.m. to contact numbers provided by participants. Calls were repeated up to twice if they were unanswered. Participants who were not contactable were considered as not participating in the mid-programme telephone calls for motivation.

For interpersonal intervention, those who had good progress were invited to share encouraging messages about their physical activity experience and improve their diets at home or work with colleagues. These messages were included in monthly motivational packs. Selection of healthy recipes was provided by the Ministry of Health (MOH) and Nutrition Society of Malaysia for workers to try at home with family or friends (Siong, 2002).

At the organizational (workplace environment) level, top management personnel were involved in giving prizes to participants as a show of organizational support for those who managed to reduce their weight and recorded high levels of activity using their pedometers in the third and sixth months. The cafeteria operator, who was independent of the organization, was encouraged to provide healthy foods for workers. The operator was given the information provided by MOH for preparing healthy dishes and making them available (e.g., vegetable dishes, fresh fruits, and dishes with less oil and fats) (MOH, 2011b). A corner of the cafeteria was designated as a health information centre for a good diet and PA. Calories and fat content in common Malaysian foods were displayed on cafeteria tables. Environmental modification in other areas included health posters on bulletin boards in offices and corridors, posters near staircases to promote stair-climbing, and a gym poster showing calories burned for different activities. Posters were pre-tested and changed monthly, as in Table 2 (MOH, 2011a).

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Table 1: ***Topics for monthly motivational packs***

Month	Topics
1st	**Welcome newsletter to participants** **General healthy lifestyle advice:** Pamphlets on Healthy Weight, Diabetes Prevention, Love Your Heart & Motivation to Quit Smoking
2nd	**Motivation for a healthy lifestyle:** Pamphlets on Reduce Sugar Intake, Eat More Fruits & Vegetables & Reduce Fat Intake
3rd	**Motivation to improve PA and dietary intake:** Pamphlets on Stretching at Work, Healthy Lifestyle, Prevent Diabetes & First Aid for Sports Injuries information
4th	**Advice for increasing PA and reducing weight with family members:** Pamphlets: Tips for meeting 10,000 Steps Guideline & Reducing Weight Safely through Physical Activity and a Healthy Diet Tips to Reduce Sugar in Diet & Exercise for the Elderly Bookmarks with information for healthy PA and diet **Results from 3rd-month assessment:** Congratulatory messages to participants who managed to lose weight and had good PA levels during the previous month
5th	**Advice and tips to reduce the risk of non-communicable diseases:** Healthy Recipes, Guide to Increase PA booklet, Stress Management & Relaxation Technique pamphlets
6th	**Final newsletter**: **Encouragement to continue a healthy lifestyle and achieve ideal body weight** **Co-worker motivation:** Sharing of information and encouragement from workers who successfully lost weight or achieved an active lifestyle **Congratulatory messages:** Certificates of Appreciation for all participants Special messages for those who reduced at least 5% of body weight and had good PA

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Table 2: ***Health poster topics at the intervention worksite***

Month	Topic
1st	Food Pyramid for Balanced Diet & Examples of Diets with Recommended Calorie Intake for a Day
2nd	Tips to Reduce Calorie Intake & Tips to Eat Healthily
3rd	Motivation to Achieve Ideal BMI & Exercising Safely
4th	Ways to Achieve 10,000 Steps a Day & Love Your Heart, Live Healthily
5th	Calories in Common Foods & Walking is Good Exercise
6th	Exercising Properly to Reduce Injury

For ethical purposes, the control group was also given minimal health education. Throughout the study, both sites were given three similar health talks on obesity, PA, and healthy eating, which were not part of the programme. MOH pamphlets with healthy lifestyle information publicly accessible were made available during data collection (see Figure 1). Reporting of the results from the intervention followed the TREND Statement for a standardized method for reporting non-randomized trials (Des Jarlais et al., 2004).

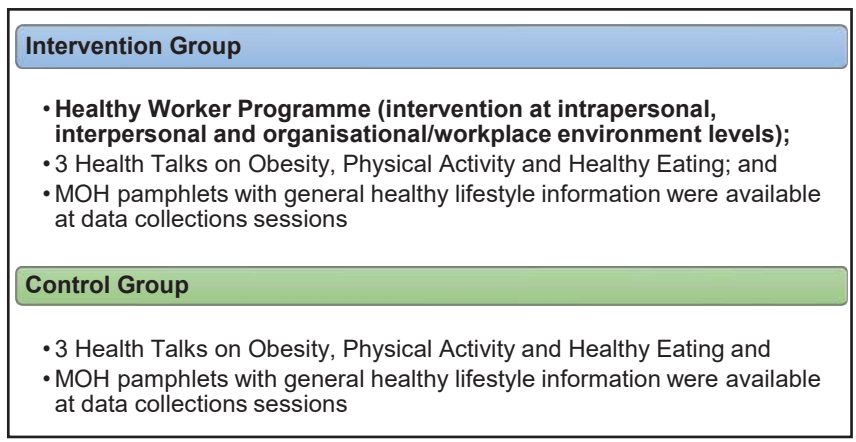


Figure 1: *Intervention and Control Groups*

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Evaluation of the Programme

The programme was evaluated on its process, behavioural and health impacts, and organizational outcomes (Cox, 2003). behavioural and health impacts were weight, PA, and dietary intake. QOWL was assessed as an organizational outcome. The primary outcomes were weight and BMI. Secondary outcomes were PA, QOWL, and dietary intake. Data was collected at mid-programme (3rd month), programme end (6th month), and post-programme (9th month) for all outcomes except for dietary intake. Dietary intake was assessed at baseline, programme end, and post-programme. This reduced the number of forms for workers to fill at mid-programme. The post-programme assessment (9th month) was to observe the sustainability of health changes in the short term for the intervention group and any temporal changes in the control group.

Anthropometric weight, height, and BMI measurements were conducted as prescribed in the MOH manual for assessments of non-communicable disease risks (MOH, 2007). A trained research assistant who was unaware of the intervention conducted anthropometric measurements. Weight and height were measured using a SECA digital scale and stadiometer. Weight loss was calculated by subtracting the weight at the assessment period from the baseline weight; as much as five to ten percent initial weight reduction is recommended for overweight and obese individuals (NCCFN, 2010). BMI was calculated by dividing participants' weight (kilograms) by the squared height value (meters). Participants' BMI was classified following the MOH Clinical Practice Guidelines for Obesity (MOH, 2004).

PA was measured with a pedometer and the validated Malay International Physical Activity Questionnaire (IPAQ) short form (Craig et al., 2003; IPAQ, 2011). The YAMAX CW-700 pedometer (Yamax Cooperation, Tokyo, Japan) was used to record participants' daily steps. The pedometer resets itself to '0' steps at midnight and has a memory recall for the last seven days (Oliver et al., 2011). Participants were asked to use the pedometer for seven days consecutively, from the moment they woke up until they slept at night. The pedometers were worn at the hip, on a belt, or at the waist of their skirts/pants. They were only allowed to remove their pedometers when bathing, sleeping, swimming, during contact sports, or when there was excessive shaking, such as when riding motorbikes. They recorded their daily step counts before sleeping at night (before midnight) for seven days. Records with at least three-day readings were included in the analysis for average daily steps (Tudor-Locke et al., 2005). Step data were cleaned by removing records of steps less than 100 or more than 50,000 steps per day (Bassett et al., 2010). Besides

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observing average daily step counts, participants were also categorized into those who achieved 10,000 steps per day (Tudor-Locke & Bassett, 2004). As pedometers are limited to activities with step counts, the IPAQ short form assessed overall vigorous and moderate activities in the last seven days. PA was analysed in Metabolic Equivalent Task minutes per week (MET-mins/week) and categorized as low, moderate, or high PA levels (IPAQ, 2010).

A diet record assessed dietary intake (Crawford et al., 1994). Participants were given a booklet with pictures of examples of portions of common foods and drinks based on the Atlas of Food Exchanges & Portion Sizes (Suzana et al., 2009). They were required to record everything they ate or drank on two working days and one day at the weekend. Diet records were analysed for average energy, macro-, and micro-nutrients daily intake with the Nutritionist Pro computer software (Version 3.0, Axxya Systems, USA, 2007). The nutrients analysed were protein, carbohydrate, fat, sodium, sugar, and vitamin C.

QOWL is seen as a part of the overall quality of life, which is influenced by work (Van Laar et al., 2007). QOWL was measured using the validated Malay version of the Work-Related Quality of Life-2 Scale (Sulaiman et al., 2015). Changes in average overall QOWL and QOWL factors which are General Well-Being (GWB), Job and Career Satisfaction (JCS), Stress At Work (SAW), Employee Engagement (EEN), and Home-Work Interface (HWI), were assessed. The mean scores were based on the Likert Scale of 1 to 5, where one is “strongly disagree,” two is “disagree,” three is “neutral,” 4 is “agree,” and five is “strongly agree.”

Process evaluation of the Healthy Worker Programme included assessment of the retention rate in the programme, participation in different programme components, and data collection. A surprise check on the cafeteria was carried out every three months, that is, at baseline, mid-programme (3rd month), programme end (6th month), and post-programme (9th month), using the Healthy Cafeteria Evaluation Checklist (MOH, 2011). Feedback was given to the cafeteria operator after assessments, and encouragement was given to provide healthy food options.

At the end of the programme, in-depth interviews were carried out to determine barriers to improving dietary intake and PA among intervention participants. Interviews were held until no new information was gathered from them, that is, until saturation point. Subjects for interviews were selected purposively, with varied backgrounds, from both genders and different ethnic backgrounds, categories of staff, marital status, age groups, and levels of

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achievement in the programme. Recorded interviews were transcribed verbatim (Gantley et al., 1999). The researcher coded the data. Data were analysed thematically from the content using the cutting and sorting method (Gantley et al., 1999; Tong et al., 2007). Data was reported with reference to the "Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines (Tong, Sainsbury & Craig, 2007). Figure 2 shows the logic model of the programme.

Data Analysis

Data were entered by a research assistant who was unaware of the intervention. The researcher checked the database for errors, missing data, and outliers. Data were analysed using the IBM-SPSS statistical software version 16.0 (SPSS Inc., 2007). Data analysis was carried out using 'modified intention to treat.' Participants with baseline data and at least two out of three follow-up data for weight, BMI, PA, and QOWL outcomes were included in the analysis. For dietary intake (where there was no mid-programme assessment), participants with baseline and at least one more follow-up data were included (Abraha & Montedori, 2010). Missing data were replaced with the last observation carried forward. Possible changes due to maturity effects or secular trends were determined by examining the control group.

Data were analysed for frequencies and demographic details. Continuous variables were tested for normal distribution. Categorical variables were analysed using the Chi-square test. Repeated measures ANCOVA was used to assess differences within and between groups for the different periods while controlling for any confounding factors, such as education level and baseline differences. As groups of individuals were assigned to study conditions, the analysis was performed at the group level, where mixed-effects models were used to account for random subject effects in each group (Murray, Varnell & Blitstein, 2004). For qualitative data, thematic analysis from in-depth interviews was conducted using the cutting and sorting method (Gantley,1999; Tong, Sainsbury & Craig, 2007).

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Figure 2: ***Logic model of the Healthy Worker Programme***

Input		Output			Outcomes
Organisational Level Creates a supportive office environment to promote PA and healthy dietary intake		**Activities** • Encourage healthy lifestyle, prizes given by organisation for weight loss and increase in PA • Health poster displays at various sites (eg. notice board, corridors) • Table top information on fat and calorie content in common foods and dishes at cafeteria and pantry • Encourage provision of healthy food at cafeteria	**Participation** Management, workers, cafeteria operator		**Health:** Changes in weight & BMI
Interpersonal level Encourages healthy interactions between co-workers and with friends/ family members to promote PA and healthy diet	→	• Motivation from co-workers to maintain healthy lifestyle • Tips to exercise and recipes to cook with family and friends	Co-workers, family and friends	→	**Behaviour:** Changes in PA levels and dietary intake **Organisational:** Changes in QOWL and QOWL factors
Intrapersonal level Influences the individual to make healthy changes		• Monthly health information leaflets • Telephone call motivation at third month	Workers		
Monitoring & Evaluation of Programme					

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3.0 RESULTS

A total of 283 workers enrolled in the study, 132 and 151 workers at the intervention and control sites, respectively. The mean age for intervention participants was 43 years (s.d.= 11) and 40 years (s.d.= 12) for controls. Participants were mostly Malays and married. There were similar gender distribution and proportion with chronic diseases in both groups. At the intervention site, significantly more participants had a higher degree and income. There was no significant difference between the number of dependents the participants had, which may affect their homework interface for QOWL (see Table 3).

There were 18 (14%) and 21 (14%) dropouts from the intervention and control sites in the sixth month. This translated to a retention rate of 86% in the Healthy Worker Programme. However, sometimes staff were unable to attend all the follow-up assessments (at the 3rd, 6th and 9th months). This caused some missing data at some time points. Data was missing at random. Using modified intention to treat, the response rate was based on the primary outcome of weight. At the end of the study (9th month), data from 93 (71%) participants at the intervention and 90 (60%) participants at the control site were analysed for their weight and BMI changes. Data attrition rates using these outcomes were 29% and 40% at the intervention and control sites, respectively (see Figure 3).

At baseline, the mean weight of respondents was 73.5 kg and 70.1 kg at the intervention and control worksites, respectively, with no significant difference. The average BMI of the respondents was 29.0 and 27.6 kg/m^2 at the intervention and controls, respectively. While the BMI difference was statistically significant, both average body mass indices were clinically within the Obese I category (MOH, 2004).

While no significant weight or BMI changes were seen at mid-programme, at programme end (6th month), there was a significant weight change between groups. There was a mean weight reduction of 1.2 kg in the intervention group and a mean increase of 0.3 kg in the control group. The proportion that lost at least five percent of their original weight was significantly more in the intervention group, 14%, compared to 4% in controls. The intervention group was 1.6 times more likely to lose at least 5% of their body weight than controls (RR = 1.6; 95% CI: 1.2, 2.2). A significant mean BMI reduction of 0.5 kg/m^2 was seen in programme participants, while there was an increase of 0.1 kg/m^2 among controls compared to baseline.

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Table 3: ***Socio-demographic details of participants who enrolled into the study***

Characteristic		Intervention (n=132)	Controls (n=151)	p-value
Gender	Male	51(39%)	69(46%)	*NS* [b]
	Female	81(61%)	82(54%)	
Mean age (years)		42.55 (sd=10.58)	39.52 (sd=12.07)	*NS*[a]
Ethnicity	Malay	122 (93%)	146 (97%)	*NS* [b]
	Other ethnicity	10 (7%)	5(3%)	
Education Level	SPM or lower	43(35%)	69 (48%)	*0.02* [b]*
	Pre-university/ Diploma	33(27%)	44(30%)	
	University/ postgraduate	46(38%)	32(22%)	
Marital Status	Married	105(80%)	108(73%)	*NS* [b]
	Not married	26(20%)	40(27%)	
Monthly Household Income (RM)	1500 or less	18(14%)	34(23%)	*0.04*[b]*
	1501- 3000	42(32%)	49(33%)	
	3001- RM6000	37(28%)	46(31%)	
	>6000	32(18%)	19(9%)	
Has a chronic illness *(eg. Diabetes high blood pressure, asthma)*		47(36%)	41(27%)	*NS*[b]

[a] *independent T-test;* [b]*Chi-square Test; NS-not significant; *significant difference (p < 0.05)*

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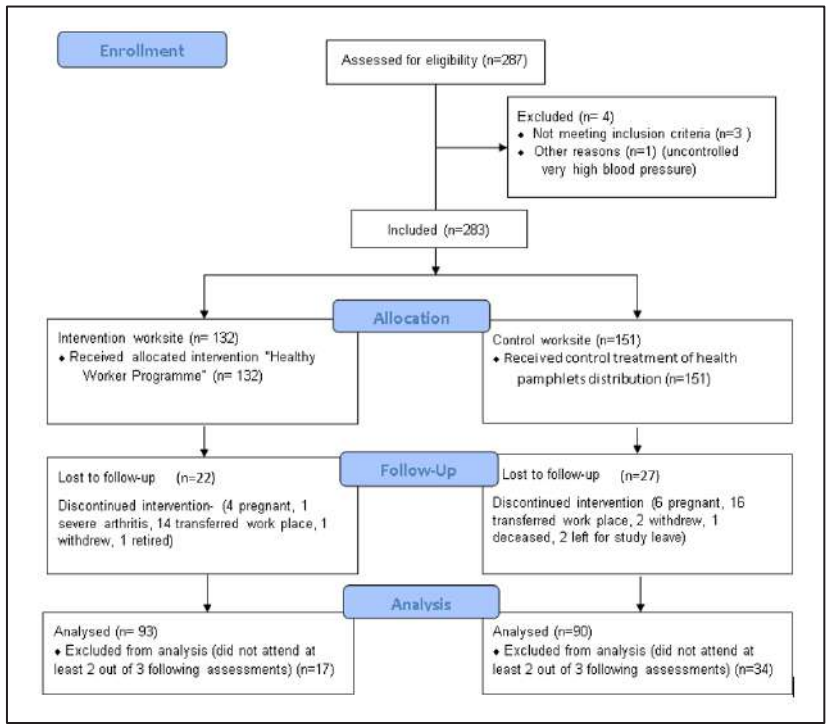


Figure 3: ***Flowchart of the Study***

At post-programme (9th month), the proportion who lost five percent of their original weight was 12% among the intervention group and 8% among controls. There was a mean BMI reduction of 0.1 kg/m^2 in the intervention group compared to an increase of 0.1 kg/m^2 among controls, but these differences were not statistically significant in the 9th month. However, overall, there were significantly more mean weight and BMI reductions within the intervention group if compared within and between groups (see Table 4).

There were low response rates for the PA, dietary intake, and QOWL assessments, and results should be interpreted cautiously. This was probably because obtaining the information required workers to complete many forms and monitor. IPAQ forms where participants answered “unsure” for any type of PA could not be analysed.

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Table 4: ***Changes in weight and BMI compared to baseline at 3rd month (mid-programme), 6th month (programme end) and 9th month (post-programme)***

Changes	Time	Intervention (N=93) Mean (sd) n (%)	Control (N=90) Mean (sd) n (%)	Overall mean difference (intervention – controls)	*p-value
Change in weight (kg)	3rd month	+0.01(1.79)	-0.04 (1.94)	**-0.68*** **(95% CI: -1.30, -0.10)**	[a]*Significant difference (p=0.003) within groups and between groups (p=0.02)*
	6th month	**-1.16 (2.42)***	**+0.33 (2.22)***		
	9th month	-0.32 (2.31)	+0.29 (2.88)		
Change in BMI (kg/m^2)	3rd month	-0.001(0.709)	+0.006(0.743)	**-0.19*** **(95% CI: -0.35, -0.04)**	[a]*Significant difference (p<0.001) within groups and between groups (p=0.02)*
	6th month	**-0.46 (0.95)***	**+0.14 (0.88)***		
	9th month	-0.13 (0.92)	+0.12 (1.1)		
5-15% weight loss	3rd month	4 (4%)	4 (4%)		*NS*[b]
	6th month	**13 (14%)**	**4(4%)**		**0.03**[b]*
	9th month	11(12%)	7(8%)		*NS*[b]

[a]ANCOVA repeated measures; [b]*Chi-square Test* *significant difference ($p < 0.05$), *NS*-not significant

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For overall PA assessments using questionnaires, 20 (15%) and 27 (17%) participants' data were analysed from the intervention and control groups, respectively. There was a significant, moderate correlation between mean steps per day (from pedometer records) and the overall PA (r=0.5, p=0.01). At baseline, there were significantly lower levels of PA at the intervention site compared to controls. There was no significant difference in PA between both groups at mid-programme and its end. However, post-programme, significantly more respondents of the intervention group had moderate and high levels of PA, while controls had more low levels (see Table 5).

A total of 82 participants' diet records were analysed: 38 (29%) from the intervention group and 44 (39%) from the controls. There was no significant difference between energy intake within or between groups at baseline or other time points. However, overall calorie intake was reduced between the 9th month (post-programme) compared to the baseline for both groups but was not statistically significant. Throughout the study, the overall energy intake of both groups was, on average, 54% from carbohydrates, 15% from protein and 30% from fat intake. This was within the recommended nutrient intake (RNI) for Malaysians (NCCFN, 2010). There was a significant overall mean difference between the percentage of carbohydrate daily intake between baseline and the 6th month, a reduction of 3%. In the 9th month, there was also an overall significant mean reduction of 20 grams of carbohydrates (80 kilocalories) compared to baseline. The overall mean sugar intake among participants throughout the study was 35g. This was equivalent to a mean of 10% of their energy intake. This was within the recommended level of not more than 10% of total energy intake (NCCFN, 2010).

The overall mean daily intake of sodium was 2023mg. This was slightly above the amount recommended by the World Health Organization (WHO), which is less than 2000mg a day of sodium for adults to reduce blood pressure and risk for cardiovascular disease (WHO, 2012). At baseline, the intervention group consumed less vitamin C, with a daily average of 58mg, while the control group consumed 63mg. This was less than the recommended daily vitamin C intake of 70mg (NCCFN, 2010). While there was little change at the programme end (6th month), at post-programme (9th month), the intervention group had increased their mean dietary vitamin C intake by 11 milligrams compared to baseline, nearing the recommended vitamin C intake. There was little change in vitamin C intake among controls. Vitamin C consumption reflected fruit and vegetables in workers' diets. However, the

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differences in macro- or micronutrients were not significant between or within groups (see Table 6).

Table 5: ***Changes in overall physical activity (PA)***

Changes	Time		Intervention (N=20) n (%); Mean (sd)	Control (N=27) n (%); Mean (sd)	p-value
PA level	**Baseline**	***Low***	10 (50%)	3 (11%)	***0.01****
		Moderate	8(40%)	19(70%)	
		High	2 (10%)	5 (19%)	
	3rd month	***Low***	5 (25%)	7(26%)	0.39
		Moderate	6 (30%)	13(48%)	
		High	9(45%)	7 (26%)	
	6th month	***Low***	4(20%)	6 (22%)	0.98
		Moderate	12 (60%)	16 (60%)	
		High	4(20%)	5 (18%)	
	9th month	***Low***	1(5%)	12 (45%)	***0.01****
		Moderate	13 (65%)	9 (33%)	
		High	6 (30%)	6 (22%)	

**significant difference ($p < 0.05$); mid-programme (3rd month), programme end (6th month) and post-programme (9th month)*

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Table 6: ***Average daily dietary intake***

Nutrient	Time	Intervention (n=38) Mean (sd);%	Control (n=44) Mean (sd);%	p-value
Energy intake (kcals)	Baseline	1447 (332)	1454 (434)	*NS*
	6th month	1459(354)	1406 (329)	
	9th month	1381 (415)	1321 (344)	
Carbohydrate (g)	Baseline	198 (48)	204 (66)	Overall significant mean reduction of 20g between baseline and 9th month, (p=0.0l)
	6th month	196 (60)	181g (55)	
	9th month	191 (66)	172g (49)	
Carbohydrate (% of mean energy intake)	Baseline	55%	56%	Overall significant reduction of 3% at 6th month compared to baseline (p=0.04)
	6th month	54%	52%	
	9th month	55%	53%	
Protein (g)	Baseline	54.8 (14.0)	53.2 (18.1)	*NS*
	6th month	55.6 (17.6)	55.0 (15.9)	
	9th month	51.8 (16.3)	51.6 (15.9)	
Protein (% of mean energy intake)	Baseline	15%	15%	*NS*
	6th month	15%	16%	
	9th month	15%	15%	

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Fat (g)	Baseline	49g (16.0)	45g (19.5)	*NS*
	6th month	49g (15.9)	47g (14.5)	
	9th month	46g (14.1)	45g (15.4)	
Fat (% of mean energy intake)	Baseline	30%	28%	*NS*
	6th month	30%	31%	
	9th month	30%	30 %	
Sugar (g)	Baseline	36 (23)	32 (19)	*NS*
	6th month	40 (44)	30 (17)	
	9th month	39 (44)	31 (22)	
Sugar (% of mean energy intake)	Baseline	9.7 (4.9)	9.3(5.2)	*NS*
	6th month	10.0(7.2)	8.4(4.2)	
	9th month	10.7(8.2)	9.7(6.3)	
Sodium (mg)	Baseline	2110 (768)	1804 (870)	*NS*
	6th month	2074 (712)	2101 (1018)	
	9th month	2115 (871)	1964 (936)	
Vitamin C (mg)	Baseline	58 (41)	63 (60)	*NS*
	6th month	56 (37)	62 (59)	
	9th month	69 (46)	65 (63)	

**significant level p < 0.05; NS-not significant*

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QOWL was analysed from 37 (29%) and 36 (24%) participants from the intervention and control groups, respectively. At baseline, there were no significant differences in mean scores for the factors of QOWL for Job and Career Satisfaction (JCS), Home-Work Interface (HWI), Employee Engagement (EEN), and General Well-Being (GWB). However, Stress At Work (SAW) was slightly but significantly higher among the intervention group (mean score = 2.60) compared to controls (mean score = 2.25). At baseline, the overall QOWL mean scores (calculated from GWB, JCS, EEN, HWI, and reversed SAW scores) were 3.79 and 3.89 at the intervention and control sites, respectively, with no significant difference. These scores were close to a rating of 4 regarding agreeing with a good QOWL (the maximum score is five, which means 'strongly agree').

An increase in mean QOWL score compared to baseline was seen in the intervention group at the end of the programme (6th month). QOWL continued to increase modestly for the intervention group at post-programme (9th month), where there was a slightly higher mean score among the intervention group compared to controls. The mean QOWL score difference was 0.12 between the two groups at post-programme (95% CI: 0.01, 0.24). There appeared to be an increase in 'General Well-Being' and a reduction in 'Stress At Work' among the intervention group compared to controls, contributing to an increase in QOWL over time. At the 9th month, 'Job and Career Satisfaction' and 'General Well-Being' were improved beyond baseline and 'Stress At Work' was reduced below baseline in the intervention group. No specific trend of improvement beyond baseline was seen among controls with time. It is possible that the control group showed temporal QOWL changes throughout the year (see Table 7).

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Table 7: ***Mean change in QOWL scores compared to baseline***

Time	Mean change in QOWL Score		95% CI
	Intervention (n=37) Mean (sd)	Controls (n=36) Mean (sd)	
3rd month (mid-programme)	-0.04 (0.28)	-0.12 (0.20)	-0.02, 0.21
6th month (programme end)	+0.02 (0.34)	-0.10 (0.22)	-0.02, 0.27
9th month (post-programme)	+0.06 (0.34)	-0.06 (0.24)	0.01, 0.30*

**significant changes*

Process evaluation of the programme

A total of 79 participants (84%) returned their programme evaluation forms at the end of six months at the intervention site. The participants' feedback on intervention components is shown in Table 8.

Table 8: ***Participation and feedback on intervention components***

Intervention	Percentage (n=79)
Read health posters	96%
Found pedometers helpful in improving PA	94%
Display of calories at the cafeteria motivates to eat healthily	84%
Tried out healthy tips	84%
Involved family members in making healthy changes to diet and PA	77%

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Tried out healthy recipes	65%
Read monthly health tips and motivation:	
Yes	51%
Sometimes	47%
No	2%
Found motivational phone calls helpful:	
Yes	43%
No	19%
Unable to be contacted	38%

Throughout the programme, positive observations at the cafeteria were sauces, salad dressings were served separately, desserts were prepared in small portions, and mineral/drinking water was available. By the programme's end (6th month), there were more healthy options of fresh foods (fruit slices, juices, and vegetable salads) and wholemeal options. Negative observations included no low-fat alternative for dairy products, more than one dish containing coconut milk, bad high-fiber grain food choices, no low-fat salad dressing, and more than half of desserts were not prepared using healthy cooking methods.

Overall, there appeared to be a wider option of healthier food choices towards the end of the study. Post-programme, at least half of the dishes were prepared in a healthier manner (steamed, baked, and stewed). However, there was no reduction in less healthy food options such as pastries, high-fat desserts, and dishes cooked with coconut milk.

Barriers to improving PA and dietary intake

The saturation point of the interviews on barriers to improving PA and dietary intake among participants occurred by the tenth interview. Participants interviewed were of varied backgrounds, staff categories, and levels of achievement in the programme (see Table 9). The barriers were grouped into four main themes: environmental exposures, health conditions, psychological barriers, and poor knowledge.

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Table 9: ***Characteristics of interviewed participants***

No	Gender	Job category	Age (years)	Race	Marital status	Comments
1	Male	Officer	32	Malay	Married	Low PA level
2	Male	Support staff	40	Malay	Married	Highly active
3	Male	Support staff	40	Indian	Married	Active
4	Male	Officer	40	Malay	Married	Low PA level
5	Male	Officer	53	Malay	Married	On average has moderate PA, but achieved high PA level at one assessment
6	Male	Officer (Unit Head)	50	Malay	Married	High PA levels
7	Female	Officer	34	Indian	Single	Moderate level of PA on average. Achieved high level of PA at one assessment.
8	Female	Support staff	57	Chinese	Married	Showed good improvement in PA levels.
9	Female	Support staff	52	Malay	Married	Low levels of PA
10	Female	Support staff	52	Malay	Married	High PA levels

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Environmental exposures at work, home or other social circles, posed a challenge to participants. Opportunity to be physically active at the workplace such as during inter-office sports, influenced workers to be more active. When no sporting activities were arranged by the organisation, workers would be more sedentary. The types of food available at work, such as that served during meetings, events or at the office cafeteria influenced their eating patterns. The same environmental influences also occurred when they were at home or involved in other social activities. The participants said:

"In terms of exercising for me, mostly is like a work as well you know, like *sukan* (sports) ya." (Participant no. 7)

"Kekangan menghalang jaga pemakanan kalau kita balik kampung… ataupun ada majlis-majlis… Kalau satu hari tu sampai ada tiga majlis (Laughs). Faham-faham je lah." ("Barriers which stop me from taking care of my diet if I go back to my hometown…or there are ceremonies…If in one day, there are up to three ceremonies (laughs). You understand.") (Participant No. 4)

Health conditions such as arthritis or muscle aches limit the type of PA a worker can do. Even though participants who could walk and do moderate activities were included in the study, poor health conditions such as during acute illness (influenza) or mild osteoarthritis may preclude them from vigorous activity. A participant said:

"Saya yang lain-lain tak ada masalah. Sakit tak ada. Tapi lenguh tu je ada masalah. Berat badan." ("I don't have any problems. No illnesses. But I get muscle aches. My body is heavy.") (Participant No. 9)

Some workers had poor knowledge on how to reduce weight through dietary changes. These participants tried to reduce their calorie intake by skipping meals. Dinner was commonly skipped, which may cause hunger and gastritis, thus reducing their motivation. Some participants were still unsure how to change their dietary patterns towards a healthier one for weight management. One of the participants said:

"*Kadang-kadang buat-buat tidur -tidur awal, tak nak makan.Tengah-tengah malam karang lapar. Kata…laparnya perut. Pedihnya perut…".* (Sometimes I try to sleep early, so I don't eat. In the middle of the night, I will

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be hungry. I will say, 'My stomach is hungry. My stomach is painful'…"). (Participant No. 9)

Participants also mentioned psychological barriers, which included poor motivation, lack of discipline, improper time management, a strong appetite, and preferences for calorie-rich foods. Participants said that time was not an issue and that if anyone wanted to exercise, one could make the time. A strong appetite for foods appeared to be a barrier for some to reduce their portions. Personal preferences and habits of consuming oily, deep-fried, coconut milk-rich, or sweet dishes made it difficult for someone to switch to healthier cooking methods such as steaming, stewing, or grilling. The participants said:

"Kita sendiri tahu, Doktor, makanan-makanan yang kita boleh makan. Tapi tulah nak mengelakkan benda tu..tak tahulah. Makan buah, sekejap je mahu dia. Lepas tu tak mahu dah, dah tak nak dah, dah jemu dah buah. Bukan tak nak. Beli kadang-kadang sampai layu dalam peti ais macam tu." ("We know, Doctor, which food we can eat. However, avoiding certain food..I don't know. I would only eat fruits for a short while. After a time, I don't want it anymore, I get bored. It's not that I don't want to. Sometimes I buy and it rots in the fridge.") (Participant No. 9).

"*Sebenarnya tak ada halangan. Cuma halangan tu kita yang buat sendiri. Contohnya masa kan. Masa untuk exercise ke ape benda. Sebenarnya masa kita 24 hours. More than enough*." *('Actually, there are no barriers. Only barriers we create ourselves. An example is time. Time for exercise or whatever. Actually, we have 24 hours. More than enough.") (Participant No. 2).*

4.0 Discussion

The multicomponent Healthy Worker Programme was a pragmatic, low-intensity intervention designed for minimal disruption of office work. It demonstrated good potential at retaining 86% of its participants in the programme. There is a lack of workplace physical and/or dietary intake interventions that observed clinically significant weight loss, that is a reduction of at least 5% of the original weight. It was observed that 14% of participants in the programme achieved clinically significant weight loss at the end of the programme. A local study among overweight and obese government servants,

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which had a more intense intervention with five exercise sessions weekly, dietary advice, and behavioural counselling, also reported a similar proportion (14%) of participants who reduced between five to ten percent of their initial body weight (Appukutty et al., 2014). A study among university employees with pre-diabetes, which included 16 weeks of exercise, diet, weight self-monitoring records, calorie booklet and goal setting of 10,000 steps per day, showed an average reduction of weight by 5.5% among the intervention group compared to 0.35% in controls (Miller et al., 2015).

There was a mean reduction of 0.5 kg/m^2 in BMI and 1.2 kg in weight among the Healthy Worker Programme participants. This is comparable to what was reported in meta-analyses of worksite interventions of PA and dietary intake, which reported a similar weight loss and BMI reduction of 0.3 kg/m^2 (Verweij et al., 2011). A systematic review of workplace PA interventions among adults, which observed cardio-metabolic outcomes, also observed a similar mean BMI reduction of 0.42 kg/m^2 (Mulchandani et al., 2019).

This Healthy Worker Programme also assessed the short-term sustainability of changes post-programme, three months after the programme ended, which is not commonly assessed in other similar workplace studies. Weight reduction appears to be sustainable in the short term, with 12% of programme participants maintaining clinically significant weight loss post-programme. Even though this proportion seems small in the study, worksite health programmes contributing to weight reduction translate to impactful benefits at the population level.

This study observed that weighing participants was a quick and effective method to assess health outcomes. Assessing changes in PA, dietary intake and QOWL was more challenging as it involved record-keeping and filling of multiple forms by workers. It is possible that workers had time constraints and other commitments. While data was limited, there appeared to be a modest, positive improvement in the PA and QOWL of workers in the programme. PA increased gradually post-programme, where programme participants recorded an average of 665 more steps per day compared to controls. Workplace health promotions have increased PA (LaCaille et al., 2016; Lassen et al., 2018; Mohd Ghazali, 2016) and healthy changes in strength, weight and lipid levels (Lassen et al., 2018). Breaks from sedentary time at the workplace reduce cardiovascular risk (Healy et al., 2018).

Limited data from dietary assessments also showed a modest increase in vitamin C from fruit and vegetable intake in the intervention group and reduced carbohydrate intake overall at the end of the study. Other

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workplace nutrition interventions have also shown improvement in workers' diets, such as more fruits and vegetables and a reduction in calorie and fat intakes (Hendren & Logomarsino, 2017; Lassen et al., 2014; Schliemann & Woodside, 2019). It is a concern in this study that average salt consumption in both groups was slightly above the recommended intake as this may increase the risks of developing hypertension (NCCFN, 2010). Increased salt consumption can occur when eating processed foods or at food stalls. Sodium and sugar intake should be kept to a minimum to prevent non-communicable diseases.

Ill health due to physical inactivity and poor diet contributes to medical costs and lower productivity at work (Vargas-Martinez et al., 2021). Health promotion may positively affect worker well-being, ability to cope with stress at work, and QOWL in general. QOWL scores increased in the intervention group through reduced 'Stress At Work' and improved 'General Well-Being.' Modest changes to QOWL were observed throughout the programme and post-programme in the intervention group. A systematic review of nutrition and fitness interventions showed that improving work-related outcomes through health promotion, including worksite physical environment modification, is possible. However, such interventions may take time to impact work-related outcomes (Grimani, Aboagye & Kwak, 2019). There is a lack of published studies on using the Work-Related Quality of Life Scale-2 in longitudinal studies, workplace PA, and dietary intake interventions. More studies are required to determine QOWL changes with such workplace interventions.

A strength of this study includes the quantitative and qualitative process evaluation, which is seldom reported in interventions. The majority of participants who gave feedback stated that they read health posters, displays of calories at the cafeteria motivated them to eat healthily, tried healthy tips, and involved family members in making healthy changes to diet and PA. About half of these participants read the monthly healthy tips, while 47% reported that they sometimes read them. Barriers found were environmental exposures that influenced daily choices, poor health, inadequate knowledge of reducing weight through diet and PA as well as psychological barriers. Co-morbidities have been found to disrupt regular exercise routines (Casey et al., 2010). Habitual conditioning, probably since he was young, could have developed a taste for less healthy foods. Similar issues were reported in a systematic review of barriers to achieving a healthy diet and PA levels at the workplace (Mazzola, Jackson & Thiele, 2019). Motivation, monitoring, and encouragement are important during and after a health programme (Casey et al., 2010). The

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Healthy Worker Programme could be further improved with more health education, counselling, and motivation from a multidisciplinary team, including a behavioural psychologist and dietitian. Health messages could also be delivered to workers in other forms through the internet (such as through emails or smartphones) (Ross KM & Wing, 2016).

The study has its limitations, as there was no randomization. Still, the quasi-experimental design is commonly used to reduce contamination bias at worksites, where intervention is held at a worksite while another is a control site (LaCaille et al., 2016; Lassen et al., 2014; Upadhyaya et al., 2020). Other limitations are recall bias, data attrition bias, and the 'Hawthorne effect' where participants may have behaved differently when they know they were being observed. Pedometers may increase motivation to walk (Bravata et al., 2007) and workers may under-eat on days they recorded their diets (Crawford et al., 1994). Workers who participated until the study ended may have been the most motivated. It is also possible that there may have been other environmental influences (from other social circles or the media) that could have affected health behaviour or QOWL. However, these limitations could occur in both groups. While BMI is a useful population measure for obesity among adults, it does not take into account the percentage of body fat (WHO, 2021b) and this can be conducted in future studies. Generalisability of the study is mostly limited to urban, Malay office workers. Future studies can be carried out among other groups of workers, with varied ethnicity and at other regions in Malaysia to test the reproducibility of the intervention. As sustainable changes were assessed in the short term due to time constraint, future studies can look at health benefits over a longer duration.

While there have been successful obesity interventions, obesity prevalence continues to rise as there is a lack of sustained, healthy behavioural changes in interventions. Intervention strategies at a population level such as community-based approaches or policy change, are recommended. It would be beneficial if all workplaces had a policy for reducing risks of obesity and non-communicable disease among workers (Stephens, Cobiac & Veerman, 2014). Workplace health promotions may be directed at workers who have risk factors for developing diseases. This will address health conditions which may contribute to absenteeism, reduced work productivity and medical care costs for organisations (Meng et al, 2017). A study by Kilpatrick and colleagues (2014) found that workers may be interested in being involved in healthy lifestyle changes. Pinkstaff and colleagues (2017) recommended that organisations have a dedicated executive officer with a healthcare background

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and trained in delivering healthy lifestyle interventions, to be in charge of health behaviour and safety of workers. Empowerment is important as workers and employers take on more responsibility to combat obesity. National workplace health promotion registries would also facilitate assessing their effectiveness (Pinkstaff et al., 2017). Workplace health promotions can play a role in tackling the global obesity problem among working adults. However, more support from the government, private sector and the community is required to sustain its efforts, monitor its progress and enhance its effectiveness.

5.0 CONCLUSION

The Healthy Worker Programme, a multi-component physical activity and dietary intake intervention for a workplace, can significantly reduce weight among overweight and obese workers. It may also improve workers' physical activity and quality of working life. The programme is sustainable for weight management in the short term and can potentially reduce the risks of developing chronic diseases associated with obesity. It is recommended that workplaces instil a health promotion programme to emphasize its commitment towards their most valuable assets, which are their workers.

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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BIBLIOMETRIC ANALYSIS OF TROPICAL BIOMEDICINE PUBLICATION TREND

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ABSTRACTS

The first bibliometric analysis for Tropical Biomedicine journals was conducted. The objectives of the analysis were to determine the distribution, trends, and impact of the published papers in Tropical Biomedicine from 2004 to 2022. We used Scopus search and VOSviewer for our analysis. These papers were divided into a few types: original articles, short communications, and reviews. The analysis found that the most frequent word in the title was Albopictus, and another popular word was Plasmodium Falciparum. Both were vector and parasite-causing fatal diseases. The most active authors were Abu Hassan and Mak by VOSviewer, whereas by Scopus search, Lee HL, Sofian-Azirun M, and Nazni WA. The differences in occurrence by these two search engines were due to statistical discrepancies by setting a few criteria by VOSviewer, while Scopus search gave real frequencies without statistical setting. Single authorship was 1.54%, whereas more than five authorship was 41.64%. The most active country was Malaysia, mainly by the University of Malaya scientists, followed by the Institute for Medical Research, the University of Sciences Malaysia, the University of Putra Malaysia, etc. There were increases in the publications from year to year, but they dropped to a minimum during the COVID-19 pandemic. The total number of citations recorded by this journal was 13 148, with an h-index of 38. The analysis will be useful for improving research focus and direction and attracting more medical research funding.

***Keywords**: Bibliometric analysis, publication trends, Tropical Biomedicine, VOSviewer.*

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ABSTRAK

Analisis bibliometrik yang pertama untuk jurnal Tropical Biomedicine telah dijalankan. Objektif analisis ini adalah untuk menentukan penyebaran, 'trend' dan kesan penerbitan manuskrip dalam jurnal Tropical Biomedicine dari tahun 2004 sehingga 2022. Kaedah Scopus search dan VOSviewer digunakan. Jenis penerbitan dalam jurnal ini terbahagi kepada artikel asal, komunikasi ringkas dan 'reviews'. Perkataan yang paling kerap dijumpai adalah Albopictus dan Plasmodium Falciparum. Kedua-duanya merupakan vektor dan parasit penyakit yang boleh menyebabkan kematian. Pengarang yang paling aktif adalah Abu Hassan dan Mak daripada analisis VOSviewer. Pada masa yang sama, Lee HL, Sofian-Azirun, M dan Nazni, MA adalah pengarang paling aktif daripada carian Scopus. Perbezaan antara kekerapan pengarang ini adalah disebabkan oleh penentuan kriteria dalam statistik. Penilaian pengarang tunggal adalah 1.54% manakala 41.64% untuk lima pengarang atau lebih. Negara yang paling aktif dalam penerbitan adalah Malaysia iaitu daripada golongan saintis Universiti Malaya, diikuti oleh Institut Penyelidikan Perubatan, Universiti Sains Malaysia, Universiti Putra Malaysia, dan sebagainya. Peningkatan dalam penerbitan diperhatikan dari setahun ke setahun tetapi penurunan kepada minima semasa pandemik COVID-19. Jumlah 'citation' yang merujuk kepada jurnal ini adalah 13 148 dengan indeks-h 38. Analisis ini akan berguna untuk pembangunan penyelidikan serta menarik pelaburan kos penyelidikan ke dalam sektor perubatan.

Kata kunci: *Analisa bibliometrik, Trend penerbitan, Bioperubatan Tropika, VOSviewer.*

1.0 INTRODUCTION

Scientists communicate by writing scientific articles, books, and other literature forms to explain, argue, enthuse, and convince at many different levels (Kelly, 2020). Scientific publication is a process that begins when a scientist or group of scientists decide that they have something to say that their peers in the scientific community should know about and that should have an interest or impact beyond the scientific community (Kelly, 2020). The citation is usually considered a technical practice in scientific communication to refer to the source in the text to demonstrate the information was received from an external source

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(Masic, 2013). A well-referenced document enhances the work's uniqueness and also increases its visibility (Penders, 2018).

Scientometrics analysis has been studied to provide quantitative analysis of the published scientific articles. Scientometrics, broadly known as “infometrics” (Egghe & Rousseau, 1990), was identified as the quantitative method in library, documentation, and information science. Specifically, it was closely known as “webometrics” or “bibliometrics” (Ellegaard & Wallin, 2015). Pritchard (1969) defined the term bibliometrics as the application of mathematics and statistical methods to books and other communication media, while Hulme (1923) initiated the term “statistical bibliography.” The term “Scientometrics,” derived from the Russian ‘naukometria’, was the study of measuring scientific and technological progress (Egghe, 1988). The advancement of scientometrics progress in line with technological improvements, whereas the recent new metrics included download statistics, page ranks, bookmarking tools, and sharing on social media (Ellegaard & Wallin, 2015). The data was measured not intrinsic to the text; instead, extrinsic measuring included authors, an affiliation of the author, word/subject frequencies, and usage statistics such as citations (Wilson, 2012).

Tropical Biomedicine: An Overview

The Malaysian Society of Parasitology and Tropical Medicine (MSPTM) published the Tropical Biomedicine (TB), ISSN 0127-5720, in 1984. The fully electronic and open-access TB journal (e-ISSN: 2521-9855) publishes its issues quarterly in March, June, September, and December. Tropical Biomedicine is a peer-reviewed journal that published original scientific manuscripts that contribute to advancing knowledge of parasitology, entomology, tropical medicine, zoonosis, and other aspects of biomedical research. The journal was indexed in SCOPUS since 2005, after 11 years of establishment. The journal was indexed in PubMed and Medline in June 2005 with U.S. National Library of Medicine ID 8507086. It was indexed under the Web of Science Core Collection as Science Citation Index Expanded (SCIE) and other indexes of Biological Abstracts, BIOSIS Previews, Essential Science Indicators, and Zoological Records in the category of tropical medicine, parasitology, and clinical medicine. Types of articles included original articles, short communications, and review articles. With the abundance of issues published in TB for more than twenty years, no bibliometric study has been conducted to analyse the distribution, authors, subject areas, and citations of the scientific articles published in this journal. Hence, this study intends to

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determine the distribution, trends, and impact of the published papers in Tropical Biomedicine from 2004 to 2022.

There have been several bibliometric analyses on tropical disease, parasitology, and entomology, focusing on the authors, subject areas, affiliations of authors, institutions, and countries of authors.

2.0 LITERATURE REVIEWS

Falagas et al. (2006) analysed 12 journals included in the "Tropical Medicine" category for the period of 1995-2003 in PubMed and Institute for Scientific Information (ISI) "Web of Science" databases. Journals included were *Acta Tropica, American Journal of Tropical Medicine and Hygiene, Annals of Tropical Medicine and Parasitology, Annals of Tropical Paediatrics, Bulletin de la Societe de Pathologie Exotique, International Journal of Leprosy and other Mycobacterial Diseases, Journal of Tropical Pediatrics, Leprosy review, Memorias do Instituto Oswaldo Cruz, Transactions of the Royal Society of Tropical Medicine and Hygiene, Tropical Doctor, and Tropical Medicine & International Health.* The analyses were focused on the mean impact factor of articles (highest in USA=1.65) and first author origin country (highest in Western Europe 22.7%).

Li et al. (2021) studied the bibliometric analysis of tropical medicine in China based on the Web of Science from 2010-2019. They extracted the information with VOSviewer and mapped the international collaboration with ArcGIS 10.1. According to their finding, "Parasite & Vectors" published the most articles (707), and the United States was the most internationally participating country (504; 14.95%), followed by Thailand (257; 7.63%) and the UK (186; 5.52%). The keywords analyses asserted that research clusters expanded more between 2015 and 2019 than 2010-2014, focusing on "malaria," "*Haemonchus contortus*," "apoptosis," "prevalence," "*Anopheles sinensis*," "*Aedes albopictus*," "*Toxoplasma gondii,*" "*Schistosoma japonicum,*" "*Trichinella spiralis,*" "*Echinococcus granulosus*" and "Zika virus".

Glover and Bower (2004) studied the journey of publication of Tropical Medicine and International Health (TMIH) Journal from 1996-2003 based on the Institute for Scientific Information Science Citation Index (SCI) and PubMed. The highest number of authored papers came from European countries (564, 50.9%), whereas the highest number of citations came from African countries (3512, 57.67%). The mean citation rate of the 1108 papers was 5.496. Malaria

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was the common subject area (329), followed by HIV/AIDS (83) and Schistosomiasis (83).

Ezema & Onyancha (2016) conducted a bibliometric analysis of 134 Health and Medical Journals hosted in the African Journal Online (AJOL) database. The data was obtained from Google Scholar using Harzing's Publish or Perish (PoP), including the number of papers, the total number of citations per paper, the number of citations per year, and h-index from 2010 to 2015. They discovered that only 20 African countries contributed in the publications, with the highest from Nigeria (53.7%) and South Africa (13.4%). There are more non-OA journals (51.1%) than OA journals in health and medical sciences. There is also a significant difference between the h-index of open-access and non-open-access health and medical journals in Africa ($t = 13.67$, $p < 0.05$).

Taşkın & Aydinoglu (2015) assessed the NASA Astrobiology Institute (NAI) funded research from 2008 to 2012. The NAI researchers published in high-impact multidisciplinary journals, e.g., Astrophysical Journal (13%, impact factor 6.733), Geochimica Et Cosmochimica Acta (7.2%, 8.884), Icarus (5.6%, 3.161), Science (4.5%, 31.027), etc. They also preferred the journal categories of Astronomy & Astrophysics (464), Geochemistry & Geophysics (225), Geology (169) and Science & Technology (127). The researchers collaborated with collaborators from England (48), France (45), Germany (40) and the Netherlands (34). The publications of NAI funding were cited 22,056 times between 2008 and 2012. The highest cited NAI-funded publication was titled "The HITRAN 2008 molecular spectroscopic database" in the year 2009, with 1081 citations and the highest cited author was DE Canfield with 105.

The purposes of bibliometric studies included (1) to analyse the number and distribution of articles published in journals across year; (2) to study the subject areas/ words of the articles; (3) to identify prolific authors who published articles in journals, their collaboration networks, and patterns of authorships; (4) to study the impact of scientific articles in term of citations. This bibliometric analysis involved journals from the year 2004 to 2022. This analysis included the number of articles, authors, words/ subject areas, countries, institutes of researchers, publication trends, and citations. Serious diseases such as dengue, malaria and COVID-19 were discussed in this article. Some aspects of COVID-19 screening and biomarkers for mortality were published in this paper from 2020.

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3.0 METHODOLOGY

This retrospective study was conducted on all types of documents published from 2004 to 2022 in TB in Elsevier's Scopus database. The publication data of title, author name, year, keyword, citations, issues, and page number were extracted from the Scopus database. The missing publications were confirmed with the enlisted online publications on the MSPTM website: http://mpstm.org/tropical-biomedicine-journal/. Both data resources were matched and complemented to obtain a complete dataset with no duplication and concise author and title information. A random selection of ten percent from the dataset was then matched with the journal's published articles as a measure of "quality control." Data cleaning and merging, including authors' names, pivoting, and aggregation analysis was performed with Microsoft Excel, while collaboration network graphs of co-authorship and subject area/words clusters were prepared with the software VOSviewer.

DEGREE OF COLLABORATION (K. SUBRAMANYAM'S FORMULA)
K. Subramanyam (1983)
C = Nm / Nm + Ns
Here,
"Degree of collaboration" is denoted by "C"
"Number of multiple authors" is denoted by "Nm"
"Number of single authors" is denoted by "Ns"
The result of The Degree of collaboration (C) of the study is 0.98
(1427/1449 = 0.98)

4.0 DATA INTERPRETATION

Types and publication trends of articles

After observing the journal publication data from the 2004 to 2022 June series, we found a total publication of 1429 papers. The main publication were articles (1258, 88%), followed by notes (99, 6.92%), short communications (32, 2.23%), reviews papers (22, 1.54%), supplements (11, 0.77%), case reports (5, 0.35%), clinical report (1, 0.07%), and communication report (1, 0.07%). From 2021, articles are classified into research articles and original research.

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Most frequent words in topics

There are 68 clusters found by VOSviewer software (Figure 1). Clusters 1- 8 contained ≥ 20 items, with cluster 1 containing 29 items. Items with the highest occurrences are albopictus (26), followed by simuliidae (23), simulium (14), plasmodium falciparum (14), Linn (13), cell (11), acari (10), and burkholderia (10). This study's most frequent subject area is the word "*albopictus*" with 26 occurrences found. Another high occurences of 14 was *Plasmodium falciparum*. *Aedes albopictus* is an important vector for the transmission of many viral pathogens, such as the yellow fever virus, dengue fever, and Chikungunya fever. At the same time, *Plasmodium falciparum* is a parasite causing fatal malarial infection.

Most common authors

There are 111 clusters detected by VOSviewer software (Figure 2). Clusters 1 – 7 contained > 15 items, with cluster 1 containing 37 items. Items with the highest occurrences are Abu Hassan (15) Mak (14), followed by Zeehaida (13), Oryan (8), Embi (8), Ka (8), Ahmad (7) and Eamsobhana (7). At the same time, we can observe collaborations among authors in VOSviewer. The distance line in the VOSviewer represented the collaboration networks among researchers. The nearer the dots meant higher collaborations among them, e.g., the overlapping circles between Embi N and Amin Nordin S in Figure 2.

Contrastly, from Scopus search, the highest authors were Lee H.L. (57), Sofian-Azirun M. (39), Nazni W.A. (38), and Chen C.D. (31). Discrepancies between VOSviewer and Scopus searches were mainly due to the statistical criteria set in VOSviewer. In contrast, the Scopus search reported the true frequencies of authors who contributed to TB without a statistical setting. So, we can achieve different findings from both VOSviewer and Scopus search machines.

Most active institutions

119 institutions had published articles in this journal from 2005 to 2022. The most active institution was the University of Malaya (256, 12.5%), Institute for Medical Research (138, 6.75%), University of Science Malaysia (92, 4.5%), University of Putra Malaysia (89, 4.3%), Institute for Biological Science (83, 4.1%), and National University of Malaysia (75, 3.6%) etc. (please refer to Table 1). All institutions were in Malaysia.

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Most active countries

There were researches from 79 countries published in this journal, with six papers undefined. Most active countries by Scopus search were Malaysia (688, 47.7%), followed by Iran (123, 8.5%), India (118, 8.2%), Thailand (116, 8.05%), China (81, 5.6%), Egypt (64, 4.4%), Saudi Arabia (62, 4.3%), Pakistan (59, 4.1%), Japan (56, 3.9%), and United States (37, 2.6%) etc. (please refer to Figure 3). Most papers on TB were from Malaysia, mainly from the University of Malaya (252, 17.5%), Institute for Medical Research (140, 9.7%), University of Science (92, 6.4%), and University of Putra Malaysia (89, 6.2%), *etc*. Other countries with a number of high papers reported in this journal included Iran, India, Thailand, China, *etc.* These figures may be attributed mainly due to the fact that the publisher is in Malaysia, Jalan Gombak, near our respective institutions.

Analysis of the growth of the articles

From the year 2004 to 2009, publications were < 50 annually. In 2010 – 2015, < 100 papers, and in 2016 – 2021, there were > 100, with the highest number of papers published at 118 (2017 to 2018).

Authorships

Single authorship was observed for 22 (1.54%) articles. Maximum authors 23, was found in one paper published in 2017 by authors from China. At the same time, double authorship was noted for 125 (8.75%) articles; three authorship 196 (13.72%); four authorship 266 (18.61%); five authorship 245 (17.14%); and more than five authors produced 595 (41.64%) papers. The involvement of more authors made the paper more reliant, with an average degree of collaboration of 0.98 from 2004 - 2022. However, too many authors may imply some authors are less involved in the writing of the articles.

Citations of the papers

There were 13148 citations recorded from Vol. 2, 2004, until Vol. 2, 2022 (Figure 3). Maximum citations were 1217 in 2010 and only 3 in 2022. Older journals obtained more citation counts than new journals because of review by more people have reviewed them since publication. There were 5 with citations > 1000, which were in three consecutive years: 2010 (1217), 2011 (1103), 2012 (1108), 2014 (1049), and 2017 (1069). During COVID-19 infection, citations were <100 for the years 2020 (92), 2021 (80), and 2022 (3) (please refer to Figure 4). The citation values were up and down within 100 to > 1000 citations

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annually until the COVID-19 pandemic infection was affected by the end of 2019, which result in a decline of < 100 citations.

For individual papers, the highest citation found was 208 in 2005 for Zaidan et al., followed by 130 citations for the paper by Lee Han Lin et al. in 2004 and 100 citations of the article by Shaalan et al. in 2009. The latter two authors were from our prestigious Institute for Medical Research but from different departments. The h-index for TB is 38, meaning 38 journal articles have > 38 citations. It is a maximum value of 38 journals/authors, which have each been cited at least 38 times. The h-index is a way of measuring the productivity and citation impact of the publications.

5.0 CONCLUSIONS

The highest occurrence word in the title of the journal was *albopictus*. Another popular word with high occurences was *Plasmodium Falciparum*. The current severe pandemic disease is COVID-19. Detection methods, i.e. reverse transcriptase-polymerase chain reaction (RT-PCR) and vaccines, were produced to prevent this disease. The first vaccine arrived in Malaysia on 21 February 2021. Dealing with COVID-19 involved resources, budget, and logistics, which were costly. Other severe diseases of concern were dengue fever (32,522 cases in 2021 with case fatality rate (CFR) 0.07%) and malaria.

The current cases of malaria in 2022 were divided into human malaria. All malaria (1543 cases), including *P. knowlesi* (1395, 91%), followed by *P. vivax* (103, 7%), *P. falciparum* (35, 2%), *P. ovale* (6, 0%), *P. malariae* (2, 0%), and mixed infection (2, 0%). The most frequent author was Abu Hassan, followed by Mak and Zeehaida, *etc.,* searched by the VOSviewer tool. Researchers published in this journal were mainly from Malaysia, Iran, India, Thailand, China, *etc*. Researchers from the University of Malaya published the highest number of papers in this journal, followed by the Institute for Medical Research, University of Science Malaysia, University of Putra Malaysia, *etc*. The total citation of TB was 13 148, with an h-index of 38. The data found are helpful knowledge for improving diagnostic procedures and treatment. Besides, it will attract more funding for tropical medicine research to promote healthcare globally.

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6.0 DECLARATIONS

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Ethics approval
Exempted.

Conflict of interests
The authors declare that they have no conflict of interest.

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APPENDICES

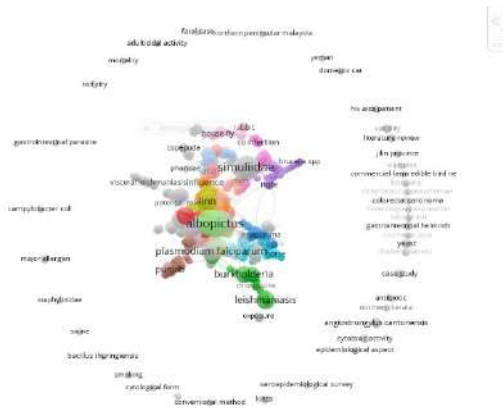


Figure 1: *Altogether, 68 clusters found. The highest occurences were albopictus (26), followed by simuliidae (23), simulium (14), plasmodium falciparum (14) etc.*

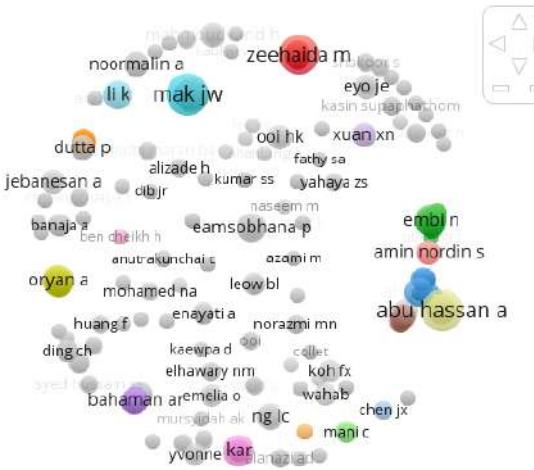


Figure 2: *Altogether, 111 clusters were detected by VOSviewer software. Items with the highest occurrences are Abu Hassan (15), followed by Mak (14) and Zeehaida (13), etc.*

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Table 1: ***Most active institutions publishing in TB 2005 – 2022***

Rate	Institution/ Organization	Frequency N = 2034	Percentage (%)	Country
1	University Malaya	256	12.5	Malaysia
2	IMR	138	6.8	Malaysia
3	USM	92	4.5	Malaysia
4	UPM	89	4.4	Malaysia
5	Institute for Biological Science	83	4.1	Malaysia
6	UKM	75	3.7	Malaysia
7	USM, Health Campus	54	2.7	Malaysia
8	Universiti Teknologi MARA	44	2.2	Malaysia
9	Mahidol University	38	1.9	Thailand
10	Faculty of Medicine, UKM	30	1.5	Malaysia
11	School of Medical Sciences, USM	29	1.4	Malaysia
12	Institute for Research in Molecular Medicine	29	1.4	Malaysia
13	International Medical University	28	1.4	Malaysia
14	Chiang Mai University	27	1.3	Thailand
15	Veterinary Research Institute - Ipoh	22	1.1	Malaysia
16	University of Veterinary & Animal Sciences, Lahore	22	1.1	Pakistan

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Figure 3: *Countries of authors published in TB.*

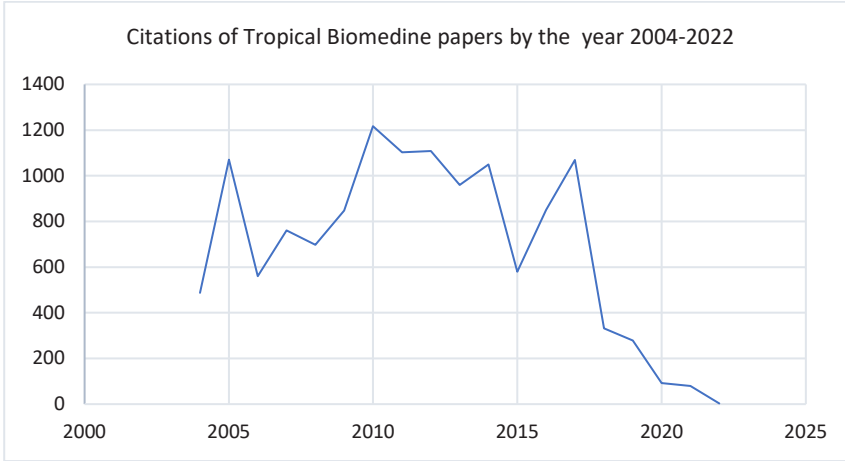


Figure 4: *Citations were recorded from 2004 TB vol. 2 to 2022 vol. 2. Highest citation was noted in the year 2010 (1217), followed by 2011 (1103), 2012 (1108); 2014 (1049), and 2017 (1069).*

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