

## DAFTAR PUSTAKA

1. Kleerekoper M, Aveoli L. Evaluation and Treatment of Postmenopausal Osteoporosis in Primer on The Metabolic Bone Diseases and Disorders of Mineral Metabolism. 2nd ed. New York: Raven Press; 1993 p. 223-8.
2. Genant H. Radiology in Osteoporosis in Evaluation and Treatment of Postmenopausal Osteoporosis. Primer on The Metabolic Bone Diseases and Disorders of Mineral Metabolism. 2nd ed. New York: Raven Press; 1993 p. 229-34.
3. Sandhu SK, Hampson G. The pathogenesis, diagnosis, investigation and management of osteoporosis. *J Clin Pathol*. 2011;64:1042e1050.
4. Kanis JA, Melton 3rd LJ, Christiansen C, Johnston CC, Khaltaev N. The diagnosis of osteoporosis. *J Bone Miner Res*. 1994 Aug;9:1137e1141.
5. Zhao LJ, Yong JL, Peng-Yuan L, James H, Robert RR, Hong WD. Relationship of obesity with osteoporosis. *J Clin Endocrinol Metab* 2007; 92(5):1640-6. <https://doi.org/10.1210/jc.2006-0572>
6. Kopiczko A, Gryko K. Body mass index, general fatness, lipid profile and bone mineral density in young women and men. *Anthropol Rev* 2017; 80(1):115-25. <https://doi.org/10.1515/anre-2017-0008>
7. Akahoshi M, Soda M, Nakashima E. The effects of body mass index on age at menopause. *Int J Obesity Related Metabolic Disorder* 2002; 26(7):961-8. <https://doi.org/10.1038/sj.ijo.0802039>
8. Kim YS, Han JJ, Lee J, Choi HS, Kim JH, Lee T. The correlation between bone mineral density/trabecular bone score and body mass index, height, and weight. *Osteoporos Sarcopenia* 2017; 3(2):98-103. <https://doi.org/10.1016/j.afos.2017.02.001>
9. Panchbhai AS. Quantitative estimation of vertical heights of maxillary and mandibular jawbones in elderly dentate and edentulous subjects. *Spec Care Dentist* 2013; 33(2):62-9. <https://doi.org/10.1111/j.1754-4505.2012.00301.x>
10. Bonjour JP, Chevalley T, Ferrari S, Rizzoli R. The importance and weak bone mass in the prevalence of osteoporosis. *Salud Publica* :S5eS17.



11. Lerner UH. Bone remodeling in post-menopausal osteoporosis. JDent Res.2006;85:584e595.
  12. Bartl R, Frisch B. Osteoporosi: Diagnosis, Prevention, Therapy.Berlin Heidelberg:Springer-Verlag; 2009:119e124.
  13. Sapre S, Thakur R. Lifestyle and dietary factors determine age at natural menopause. JMid-life Health. 2014;5:3.
  14. P.K. Siiteri, Adipose tissue as a source of hormones, Am. J. Clin. Nutr. 45 (1987) 277–282.
  15. Barondess DA, Singh M. Radiographic Measurements, Bone Mineral Density and the Singh Index in The Proximal femur of White and Black Postmenopausal Women. J Disease- A-Month 2002;48(10) : 637-656.
  16. Jalava T, Sarna S. Association Between Vertebral Fracture and Increased Mortality inOsteoporotic Patients. J Bone & Mineral Research 2003; 18(7) : 1254-1262.
  17. Ismail AA, O'Neill TW. Risk Factor for Vertebral Deformities in Men : Relationship to Number of Vertebral Deformities. J Bone & Mineral Research 2000;15 : 278-286.
  18. Nevitt MC, Cummings SR. Risk Factor for a First-Incident Radiographic Vertebral Fracture in Women >=65Years of Age : The Study of Osteoporotic Fractures. J Bone & MineralResearch 2005; 20 : 131-146.
  19. Fechtenbaum J, Cropet C. Reporting of Vertebral fractures on Spine X-rays. Osteop Intl 2005 :1939-1948.
  20. Reeve J, Lunt M, Felsenberg D. EPOS Study Group, Determinants of The Size of Incident Vertebral Deformities in European Men and Women in The Sixth to Ninth Decades of Age : The European Prospective Osteoporosis Study, J Bone & Mineral Research 2003 vol 18 : 1664.
  21. Weber K, Lunt M, Gowin W. Measurement Imprecision in Vertebral Morphometryof Spinal Radiographs Obtained in The European Prospective Osteoporosis Study : Consequencesfor Identification of Prevalent and Incident British Journal of Radiology 1999; 72: 957-966.
- r MR, O'Connor DP. Basic science. In: Miller MD, editor. Review



- of Orthopaedics. 4th ed. Philadelphia: Saunders; 2004. p. 35-8.
23. Skov AR, Haulrik N, Toubro S, Molgaard C Astrup A. Effect of protein intake on bonemineralization during weight loss: a 6-month trial. *Obesity Res.* 2002;10:432-38.
  24. Ravn P, Cizza G, Bjarnason NH, Thompson D, Daley M, Wasnich RD, et al. Low Indeks Massa Tubuhis an important factor for low bone mass and increased bone loss in early postmenopausal women. Early Postmenopausal women intervention cohort (EPIC) study group. *JBMR.* 1996 Sept;14 (9):1622-7.
  25. G. Mehta, P. Taylor, G. Petley, E. Dennison, C. Cooper, K. Walker-Bone, Bone mineral status in immigrant Indo-Asian women, *QJM: An International Journal of Medicine*, Volume 97, Issue 2, February 2004, Pages 95–99, <https://doi.org/10.1093/qjmed/hch017>
  26. Khandewal S, Chandra M, Lo JC. Clinical characteristics, bone mineral density and non-vertebral osteoporotic fracture outcomes among post-menopausal U.S. South Asian Women. *Bone.* 2012;51(6):1025–1028.
  27. Lo JC, Chandra M, Lee C, Darbinian JA, Ramaswamy M, Ettinger B. Bone mineral density in older U.S. Filipino, Chinese, Japanese, and White women. *J Am Geriatr Soc.* 2020;68(11):2656–2661
  28. Ji, M. X., & Yu, Q. (2015). Primary osteoporosis in postmenopausal women. *Chronic diseases and translational medicine*, 1(1), 9–13. <https://doi.org/10.1016/j.cdtm.2015.02.006>
  29. Gao, Chao1; Xu, Yang1; Li, Li1; Gu, Wen-Qin2; Yi, Chun-Tao2; Zhu, Qiong3; Gu, Hong-An3; Chen, Bi-Hua4; Wang, Qing-Qing4; Tang, Feng5; Xu, Ju-Liang5; Hou, Jian-Miao6; Song, Hui-Jiang6; Wang, Hui7; Wang, Zhi-Liang7; Zhang, Zhen-Lin1. Prevalence of osteoporotic vertebral fracture among community-dwelling elderly in Shanghai. *Chinese Medical Journal*: July 20, 2019 - Volume 132 - Issue 14 - p 1749-1751
  30. Samelton EJ, Christiansen BA, Demissie S, Broe KE, Louie-Gao Q, Roberts BJ, Manoharam R, D'Agostino J, Lang T, Kiel DP, . QCT measures of bone strength at the thoracic and lumbar spine:



- the Framingham Study. *J Bone Miner Res.* 2012 Mar;27(3):654-63. doi: 10.1002/jbmr.1482. PMID: 22143959; PMCID: PMC3728822.
31. Shapses SA, Pop LC, Wang Y. Obesity is a concern for bone health with aging. *Nutr Res.* 2017;39:1-13. doi:10.1016/j.nutres.2016.12.010
  32. Cao, J.J. Effects of obesity on bone metabolism. *J Orthop Surg Res* 6, 30 (2011). <https://doi.org/10.1186/1749-799X-6-30>
  33. Han, S., Park, J., Nah, S. et al. Severity of underweight and risk of fracture: a Korean nationwide population-based cohort study. *Sci Rep* 12, 10153 (2022). <https://doi.org/10.1038/s41598-022-14267-x>
  34. De laet, C., Oden, A., Johansson, H. et al. The impact of the use of multiple risk indicators for fracture on case-finding strategies: A mathematical approach . *Osteoporos. Int.* 16 , 313 – 318 .
  35. Barrera, G., Bunout, D., Gattas, V. et al. A high body mass index protects against femoral neck osteoporosis in healthy elderly subjects. *Nutrition*, 2004; 20: 769–71
  36. Fu, X., Ma, X., Lu, H. et al: Associations of fat mass and fat distribution with bone mineral density in pre- and postmenopausal Chinese women. *Osteoporos Int*, 2011; 22: 113–19
  37. Wu , S. et al. Body mass index relates to bone mineral density. *Med Sci Monit*; 2016; 22: 145-151
  38. Vincent, H., Heywood, K., Connelly, J., Hurley, R. Obesity and weight loss in the treatment and prevention of osteoarthritis. *PMR*; 2012; 4: S59–67
  39. Aguilera, B., Davalos-Vazquez, K., Jimenez-Mendez, C. et al. The relationship of nutritional status, body and mandibular bone mineral density, tooth loss and fracture risk (FRAX) in pre-and postmenopausal women with periodontitis. *Nutr Hosp* ;2014; 29: 1419–26
  40. Moran, L., Teede, H., Noakes, M. et al. Sex hormone binding globulin, but not testosterone, is associated with the metabolic syndrome in overweight and obese women with polycystic ovary syndrome. *J Endocrinol Invest*; 2013; 36:



nen, J., Kiviniemi, V., Kroger, H. et al. Body mass index and bone

loss among postmenopausal women: the 10-year follow-up of the OSTPRE cohort. *J Bone Miner Metab*; 2012; 30: 208–16

42. Nguyen, T., Center, J., Eisman, J. Osteoporosis in elderly men and women: effects of dietary calcium, physical activity, and body mass index. *J Bone Miner Res*; 2000 Feb;15(2):322-31.

43. Steinschneider, M., Hagag, P., Rapoport, M., Weiss, M. Discordant effect of body mass index on bone mineral density and speed of sound. *BMC Musculoskeletal Disorder*; 2003 Jul 16;4:15.



## LAMPIRAN

### Lampiran 1. Persetujuan Etik



#### **REKOMENDASI PERSETUJUAN ETIK**

Nomor : 681/UN4.6.4.5.31/ PP36/ 2022

Tanggal: 2 Nopember 2022

Dengan ini Menyatakan bahwa Protokol dan Dokumen yang Berhubungan Dengan Protokol berikut ini telah mendapatkan Persetujuan Etik :

No Protokol	UH22090567	No Sponsor Protokol	
Peneliti Utama	<b>dr.M.Ikhlas Yakin Iwan</b>	Sponsor	
Judul Peneliti	hubungan antara indeks massa tubuh dengan kejadian osteoporosis pada wanita menopause		
No Versi Protokol	2	Tanggal Versi	<b>28 Oktober 2022</b>
No Versi PSP	2	Tanggal Versi	<b>28 Oktober 2022</b>
Tempat Penelitian	RS Universitas Hasanuddin dan RS Jejaring di Makassar		
Jenis Review	<input type="checkbox"/> Exempted <input checked="" type="checkbox"/> Expedited <input type="checkbox"/> Fullboard Tanggal	Masa Berlaku 2 Nopember 2022 sampai 2 Nopember 2023	Frekuensi review lanjutan
Ketua KEP Universitas Hasanuddin	Nama <b>Prof.Dr.dr. Suryani As'ad, M.Sc.,Sp.GK (K)</b>	Tanda tangan	
Sekretaris KEP Universitas Hasanuddin	Nama <b>dr. Agussalim Bukhari, M.Med.,Ph.D.,Sp.GK (K)</b>	Tanda tangan	

Kewajiban Peneliti Utama:

- Menyerahkan Amandemen Protokol untuk persetujuan sebelum di implementasikan
- Menyerahkan Laporan SAE ke Komisi Etik dalam 24 Jam dan dilengkapi dalam 7 hari dan Lapor SUSAR dalam 72 Jam setelah Peneliti Utama menerima laporan
- Menyerahkan Laporan Kemajuan (progress report) setiap 6 bulan untuk penelitian resiko tinggi dan setiap setahun untuk penelitian resiko rendah
- Menyerahkan laporan akhir setelah Penelitian berakhir
- Melaporkan penyimpangan dari protokol yang disetujui (protocol deviation / violation)
- Mematuhi semua peraturan yang ditentukan



## Lampiran 2. Alat dan Bahan

### Timbangan Berat Badan



### Pengukur Tinggi Badan





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### Lampiran 3. Inform Consent

#### FORMULIR PERSETUJUAN MENGIKUTI PENELITIAN

Setelah membaca informasi penelitian serta mendengar penjelasan dan menyadari pentingnya penelitian:

#### **HUBUNGAN ANTARA INDEKS MASSA TUBUH DENGAN OSTEOPOROSIS PADA WANITA MENOPAUSE**

Maka saya yang bertanda tangan di bawah ini:

Nama :  
Umur :  
Jenis kelamin :  
Pekerjaan :  
Alamat :

Menyatakan dengan sesungguhnya bahwa saya sebagai

Diri saya sendiri/ Orang Tua/Wali dari :

Nama :  
Umur :  
Jenis kelamin :

Dengan ini menyatakan SETUJU untuk dilakukan pemeriksaan Tinggi badan, Berat badan dan foto X-Ray Radiologi. Saya mengerti sepenuhnya bahwa pemeriksaan yang dilakukan, tidak akan mempengaruhi kondisi kesehatan dan hal ini semata-mata dilakukan untuk kepentingan penelitian. Saya mengetahui bahwa saya berhak untuk menolak ikut serta dalam penelitian ini tanpa kehilangan hak saya untuk mendapatkan pelayanan kesehatan yang seharusnya saya peroleh.

Semua biaya pemeriksaan dan biaya pengobatan bila terjadi keluhan apapun sehubungan dengan penelitian ini, ditanggung oleh peneliti.

Bila masih ada hal yang masih belum saya mengerti atau saya ingin mendapatkan penjelasan lebih lanjut, saya bisa mendapatkannya dari dokter peneliti. Demikian persetujuan ini saya buat dengan penuh kesadaran dan tanpa paksaan.



.....2022

(Nama Lengkap)

(Tanda Tangan)

Saksi

.....  
(Nama Lengkap)

.....  
(Tanda Tangan)

### **Penanggung Jawab Penelitian**

Nama : dr. Muhammad Ikhlas Yakin Iwan  
Alamat : Jl. Abdul Kadir Blok 1M nomor 8, Makassar  
Hp : 081310113980

### **Penanggung Jawab Medis**

Nama : dr. M. Nasser Mustari, Sp.OT  
Alamat : Jl. Batu Putih Bundar nomor 14, Makassar  
Hp : 081355622353



#### LAMPIRAN 4 . Data Penelitian

No	Nama	Usia	TB	BB	IMT	XRAY	Status Gizi
1	Dg. Sakking	60	153	76	32,4	Spondilosis Lumbalis - Tidak Tampak Fraktur	Obesitas
	Hatija	60	148	50,2	22,9	Fraktur Kompresi L1-L2 (Genant Grade 2)	Normal
3	Sitti Dg. Sunggu	60	160	53,1	20,7	spondilosis lumbalis - tidak tampak fraktur	Normal
4	Haminah	60	157	49,2	20	fraktur kompresi L5 (genant grade 1)	Normal
5	Hasniah	59	146	78,3	36,7	spondilosis lumbalis - tidak tampak fraktur	Obesitas
6	Ramlah	57	151	53,2	23,3	fraktur kompresi L1-L3 (genant grade 1)	Normal
7	Hatijah Idris	58	151	88,4	38,7	spondilosis lumbalis - tidak tampak fraktur	Obesitas
8	Kartini	55	151	50	21,9	fraktur kompresi L2-L3 (genant grade 1)	Normal
9	Dg. Pandang	59	144	50,4	24,3	fraktur kompresi Th11-12 (genant grade 1)	Normal
10	Dorce Sura	60	143	48,9	23,9	spondilosis lumbalis - tidak tampak fraktur	Normal
11	Nuralam	55	155	63,9	26,6	fraktur kompresi L3-L5 (genant grade 1)	Overweight
12	Purwaningsih	50	142,5	49,1	24,4	spondilosis lumbalis - tidak tampak fraktur	Normal
13	Manika	60	155	65,2	27,16	fraktur kompresi L2 (genant grade 1)	Overweight
14	Sarifah	59	139	38,1	25,9	spondilosis lumbalis - tidak tampak fraktur	Overweight
15	Aisyah	60	141	45,7	23	fraktur kompresi L1-L3 (genant grade 1)	Normal
16	Nurhayati	58	148	60,8	27,7	fraktur kompresi L1-L2 (genant grade 1)	Overweight
17	Suriawati	60	152	56,1	24,2	fraktur kompresi Th12 (genant grade 1)	Normal
18	Elisabeth Gori	56	153	60,1	25,6	fraktur kompresi L3-L4 (genant grade 1)	Overweight
19	Sri Maryati	55	148	56,9	25,98	fraktur kompresi L1 (genant grade 1)	Overweight
20	Indrawaty	60	156	52,7	21,6	spondilosis lumbalis - tidak tampak fraktur	Normal
21	Normawati	60	143	50,4	24,7	spondilosis lumbalis - tidak tampak fraktur	Normal
22	Nuriati	60	145	37,1	17,6	fraktur kompresi L1-L5 (genant grade 3)	Underweight
23	Andi Ana	58	154	47,8	20,1	spondilosis lumbalis - tidak tampak fraktur	Normal
24	Djasmirah	60	154	73,5	31	fraktur kompresi L1-L3 (genant grade 1)	Obesitas
25	Saleha	60	144	59	28,5	fraktur kompresi L1-L5 (genant grade 2)	Overweight
26	Koasdiarti	60	142	68	33,8	fraktur kompresi L1-L2 (genant grade 1)	Obesitas
27	Ros Indrawati	58	154	64,3	27,1	spondilosis lumbalis - tidak tampak fraktur	Overweight
28	Suryanda	52	149	53,6	24,1	spondilosis lumbalis - tidak tampak fraktur	Normal
29	Nurhayati	60	152	71,5	30,9	spondilosis lumbalis - tidak tampak fraktur	Obesitas
30	Martina	60	139	51,7	26,7	fraktur kompresi L1-L5 (genant grade 1)	Overweight
31	Heryanti	53	148	40	18,26	fraktur kompresi L3-L5 (genant grade 2)	Underweight
		52	147	54,1	25	fraktur kompresi Th11-12 (genant grade 1)	Overweight
		51	150	73,8	32,8	fraktur kompresi L1-L2 (genant grade 1)	Obesitas
		60	151	68,6	30	spondilosis lumbalis - tidak tampak fraktur	Obesitas
		52	150	67,4	29,9	fraktur kompresi L1-L3 (genant grade 1)	Overweight



36	Sukanti	60	152	40	17,3	fraktur kompresi T6-T8 (genant grade 1)	Underweight
37	Kaswati	54	155	42	17,5	fraktur kompresi T4-T10 (genant grade 1)	Underweight
38	Sariyati Mahmud	51	153	41	17,8	fraktur kompresi T5-T6 (genant grade 2)	Underweight
39	Ramlah	56	154	40	17,3	fraktur kompresi T9 dan L5 (genant grade 1)	Underweight
40	Eka Nurmasita	53	155	39	16,25	fraktur kompresi L5 (genant grade 1)	Underweight
41	Ritha	50	156	39	16,04	fraktur kompresi T10 (genant grade 1)	Underweight
42	Nining Djaenab	52	149	45	20,27	spondilosis lumbalis - tidak tampak fraktur	Normal
43	Marta	57	148	39	17,8	fraktur kompresi T11 (genant grade 3)	Underweight
44	Halmah	57	143	48	23,52	tidak tampak fraktur	Normal
45	Sumarni	56	147	46	21,29	tidak tampak fraktur	Normal
46	Darna	56	150	40	17,7	fraktur kompresi L1 (genant grade 1)	Underweight
47	Jumiati	58	156	50	20,83	tidak tampak fraktur	Normal
48	Sudarni	51	158	52	20,88	tidak tampak fraktur	Normal
49	Nurjanna	52	157	56	22,76	tidak tampak fraktur	Normal
50	Millang	53	152	70	30,30	tidak tampak fraktur	Obesitas
51	Fatimah	54	153	50	21,36	fraktur kompresi L1-L3 (genant grade 1)	Normal





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