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ə. ¢ yɜÚŰ, Ů ɓəý´ ɛgůŬ Úłƒ´ Ůɟ ɛi ůŬƒ´ Úgɕ ŬəɐƒŮɟ ɔŬůdŬƒ, ůgɜɛəəəɐ g´ ɛůÚɟ ɜəɐ Úłƒə Ůə Úɛ Ůɛ Ůɛ ůɛ Ůɜŭ ŬŰ ɣɟ ɛɜ Úłƒə Ŭdôɦəd Úł ŭəŸɟ ə Ůə Ůłƒ Ůə´ ɦɜdůdƒ Úłƒ ɛ Ůə ɣ Úłƒ Ůgɛ ƒ.

Ágɕ Ůɟ ə ůŰůƒ dŬ ɐdŮə Ů ɜŬ Ůə úɟ Ÿůɤ ´ ɟ ɛƒ Úɛɜ ə. ɀ Ůɜɦ ɔə Ů Úɛ ůgɜŮɛ ɣƒ Ůɜŭə Ů ɣɟ ɛɜ Úɛg, Úł ɜ Ůə Ů ɟ Ů Úə ɐ ůgɜŮɟ ɔŬůdŬə Ůə Úł ɜ Ů ə ůÚł ɛɛɜəɐ ɓɛɐdŮə Ů´ ɛg ɛɛg ´ ɟ ɛůɣúŮɟ Ůů Ůə Ÿd Ů´ ɟ ɛə i ´ Úɛgů Ů Ůɜ Ÿɔəd.

Ágɕ Ůɟ ə ůÚ ə ŭəŮdŰŮɟ Ů Úł ɜ ə. dbəŮɕ Ÿəd ɔə Ů Úł ɜ ´ ɛə i Ű ɛd ɓɛɐdŮə Ů Úł ƒ ůŮɦəɛ Ůg Úɦ Úɛ ɕɟ ɛɜɛəə ɦ ŭə Ÿů Úł ɛ Ů.

¢ yəɛƒ ŭŮə dŬ ɛ´ ɛɟ ɛi ůŬɜŬ ɛd ɜ Ůə Ű Ů ɟ dı ůÚł ɜ ɛəəɛɔyɜŮə Ÿ ɛɛg , d ůgɛɓɛəɐ Úł ƒ ɛ´ ɛdŮƒ, ůŮə Ÿd Ů ɛɛg ɓɐɛ Ů, Ůɐ Ůə Ůə Ůə Úɐ d Úł.

Ū Ůɛŭ ɟ Ŭū ɤ Úɛ´ ɛi ɔɛg

ɟ Ū¢ ?ɟ *2008*

ůəůgɟůgɜɐdqəůq ůcɣůq ŰłqſɕůŰəɐɕ´gəɜɦŰłqŰŰſəŮɔŰłqſ
ɐůɛgəɶɕdqſəŮɔűŰɟɟɣŰəɕdqſůůŮůɒɛŮ Ааəɐɛɜɤɜ űɛɵŰłqŰí ɜ.

ƐTBŦBƐ. ƐgɔəůɟɟɛɣɜŮ, ůəɛ´ɦſɡɐŰŰɜ q ůəŮ´ɑůŰɤůq ůcɣůůɤɜ, Ůɜ gűɑůŰŰɜŰŰə, ɛŰŰŰɜi Ůɤɜ Ůɵ´ɣűɤɜ ɜɕůɛgəɶɕdqſəŮɔűŰɟɟɣŰəɕdqſɛɟɛi əŮɔŰɤɜ ůŮəɐŰí ɜ ŰłqſɕůŰəɐɕ´gəɜɦŰłqŰŰſ (BMD, T - score, Z - score) əŮɔɔŮɜəɦŰŰɟŮŰłqſůi ůŰŰůdqſůı ɛŮŰɛgſŰɤɜ ɜŮŰɟı ɜ Ůɜqəɶɕɤɜ ŮŰɦɛɤɜ (qpɀ Ɛ, WHR, WC, SFR, ´ɕůɛůŰɦ ůɤɛŮŰəɛi əɑɛggſ). **JɟŞ ƐTB-ɀ ÁŰBqpBƐ.** ƐŰłɜ ɣɟůgɜŮ´ɐɟŮɜ ɛɣɟɛgſ 41 ɎŰɛɛŮ(34 ɔgɜŮɒůſəŮɔ7 Ɏɜŭɟůgſ) qəɶəɒdŮſ18-23 ŰŰí ɜ. ¢ ůŰŰŰəůŰəɒɐ ŮɜɎəgůqq Ůɤɜ ŭŰůɛɛɣɜɤɜ ɣɔɶɜŮɕɟqůɵɛ´ɛɵɤ ɜŰŰſŰŰɛ ůŰŰŰəůŰəɦ´ɟɦɔɟŮɛɛŮSPSS (Version 13,0 for Windows), ɛŮɕɟɐůq ɛq´ŮɟŮɛŰŰɟɶɐɛgɛŰűɛůɛɛɔɑŮſ(ůgɜŰŰɔůůŰɛgſůgůɕɣŰəůqſŰɛg Spearman). **ɟ ŦBɓɛ ÁŞ ÁƐɀ ɟ ɛɟ ɟ .** ƐgɔəůɟɟɛɣɜŮ, ɛɵůŰŰŰəůŰəɎůqɛŮɜŰəɣſůgůɕŰŰəůəſ´ɛg ɓɟɣɏqəŮɜ ůŰłɛŮɔɣŰłɛŮgŰɛ ŰəɜŮɤ Ů) dŰŰəɐ ůgůɕɣŰəůq Ůɤɜ Ůɵ´ɣűɤɜ ɜɕůɛgəɶɕdqſɛɟɛi ɛŰŰɛɜ ůŰəɐŰłq Z - score Ůɤɜ ´ɛűɵɜ ɔɵŮŰɛ ůi ɜɛəɛ Ůɛg ůŰəɛŰŰɛgſ(p=0,025), ɓ) ŮɟɜqŰəɐ ůgůɕɣŰəůq Ůɤɜ Ůɵ´ɣűɤɜ űŰɟɟɣŰəɕdqſɛɟɛi ɛŰŰɛɜ ůŰəɐŰłq Z - score ɛəɦəɶqɟɛg Ůɛg ůı ɛŰŰɛgſɔɵŮ Ůɛ ůŰəɛŰ Ůɤɜ Ůɜůɟɜ (p=0,036), ɔ) dŰŰəɐ ůgůɕɣŰəůq ŰłqſɕůŰəɐɕ´gəɜɦŰłqŰŰſ ɛŰŰɛ qpɀ Ɛ ɔɵŮŰɛ ůi ɜɛəɛ Ůɛg ůŰəɛŰŰɛgſ (p=0,048) əŮɔŰɛ g´ɛůi ɜɛəɛ Ůɤɜ ɔgɜŮəɵɜ (p=0,025), ů) dŰŰəɐ ůgůɕɣŰəůq Űłqſ ɕůɛgəɶɕdqſɛɟɛi ɛŰŰłɜ ´ŮɟɕűɣɟůɵŮ ɛɣůdqſɔɵŮɛ ůi ɜɛəɛ Ůɛg ůŰəɛŰŰɛgſ (p=0,012) əŮɔŰɛ g´ɛůi ɜɛəɛ Ůɤɜ ɔgɜŮəɵɜ (p=0,025), Ů) dŰŰəɐ ůgůɕɣŰəůq Űłqſ űŰɟɟɣŰəɕdqſɛɟɛi ɛŰŰɛɜ qpɀ Ɛ ɔɵŮŰɛ ůgɜɛəɶɕɦ ŭŰəɐɛŮ (p=0,019), ůŮ dŰŰəɐ ůgůɕɣŰəůq Űłqſ űŰɟɟɣŰəɕdqſɛɟɛi ɛŰŰłɜ ´ŮɟɕűɣɟůɵŮ ɛɣůdqſɔɵŮɛ ůgɜɛəɶɕɦ ŭŰəɐɛŮ (p=0,007) əŮɔ ɔɵŮŰɛ g´ɛůi ɜɛəɛ Ůɤɜ Ůɜůɟɜ (p=0,007), ɛ) dŰŰəɐ ůgůɕɣŰəůq Űłqſ űŰɟɟɣŰəɕdqſ ɛɟɛi ɛŰ Ůɛɜ ŭŰəɐŰłq SFR ɔɵŮ Ůɛ g´ɛůi ɜɛəɛ Ůɤɜ ɔgɜŮəɵɜ (p=0,029). **ƐJɀ ŦÁΛɟ Ɛɀ ɟ ɛɟ ɟ .** ɀ Űɓɣůq ŰŮ Ů ɛŰŰəɣůɛŰŰŰ ŰłqſɛŭəɣůłqſŰəɐŮə ůgɜŰŰɦɜ ɜŮ ůɛgɟɣůŰɛi ɛŰ ɦŰɵ Ů) q ɕůɛgəɶɕdq ŰəɐŮə ɣɜŮſ ůgɜdŰəɦſ Ůɜŭɓɛəɶɕɦſ ´ŮɟɣɔɛɜŰŰſ ůŰŮ ɛůŰɣ əŮɔ Ůɵ´əɣɛɜ ůɢŰŰɛŰŰŰədŰŰəɣɛŰŰɛ əɑɛgſŰłqſ´ŮɟɕɛɢɛgſŰłqſəɛəɶɣſ, ɦ´ɤgſůəűɟɣůłqəŮɛŰŰɛggſůŰəŰŰſqpɀ Ɛ əŮɔWC, ɓ) q űŰɟɟɣŰəɕdq ůɢŰŰɛŰŰŰədŰŰəɣŰɦůɛ ɛŰŰɛ ů´əŮɜɜəɦ əɑɛg, ɦ´ɤgſůəŰɛɐdqəŮɛŰŰɛɜ ůŰəɐŰłq WC, ɦůɛ əŮɔɛŰŰɛ g´ɛŭɦɟɕɛ əɑɛg, ɦ´ɤgſůəűɟɣůłqəŮɛŰŰɛɜ ůŰəɐŰłq SFR.

ɕ ÁɔÁHƐ - TɕÁHqpɟ : ɜɕůɛgəɶɕdq, űŰɟɟɣŰəɕdq, BMD (Bone Mass Density, ɕůŰəɐ ´gəɜɦŰłqŰŰ), ůi ůŰŰůdq ůı ɛŰŰɛgſ, qpɀ Ɛ (qpŮəɐŰłqſɀ ɎɛŮgſƐı ɛŰŰɛgſ), WHR (Waist to Hip Ratio, əɦɔɛgſɛɣůdqſ ´ɟɛgſ ɕůɢɶɛ), WC (Waist Circumference, ŭŮɟɕűɣɟůɵŮ ɀ ɣůdqſ), SFR (Subscapular to triceps skinfold ratio, əɦɔɛgſŰłqſg´ɛɤɛɛ´əŮŰŰŮŰŰgŭŮɟɛŰŰɛ´Űɡɢɛgſ´ɟɛgſŰłqɜ ŭŮɟɛŰŰɛ´ŰɡɢɛŰɟəŮűɎəɶɛg), T - score, Z - score, ů´əŮɢɜəɦ əɑɛgſ, g´ɛŭɦɟɕɛ əɑɛgſ.

[illegible] RANK/RANKL/OPG.[102]

1.1. [illegible]

[illegible] 80% [illegible]

[illegible] 20% [illegible].[7]

1.2. [illegible]

[illegible]

1.2.1. [illegible]

[illegible] 2% [illegible]: 1) [illegible], 2) [illegible], 3) [illegible] 4) [illegible]

1.2.1.1. [illegible]

Ачасында иммунитет жүйесінің қызметі бұзылады және ағзаның инфекциялық ауруларға қарсы қорғаныш қабілеті төмендейді. Тұқым қуалайтын аурулардың ішінде ең көп тарағандары: Даун синдромы, Клайнфельтер синдромы, Шерешевский-Тернер синдромы, Дюшенн-Беккер миопатиясы, гемофилия, фенилкетонурия, муковисцидоз, адреногенитальдық синдром, қант диабеті, қалқанша безінің ауруы, бронх демікпесі, жүрек-қантамыр жүйесінің ауруларының кейбір түрлері, ревматоидты артрит, ревматизм, бронх демікпесі, жүрек ақауларының кейбір түрлері, ішек ауруларының кейбір түрлері, бүйрек ауруларының кейбір түрлері, қатерлі ісіктің кейбір түрлері, психикалық ауытқулар, ақыл-ойдың кемістігі, эпилепсия, шизофрения, маниакалды-депрессивтік психоз, Альцгеймер ауруы, Паркинсон ауруы, Хантингтон ауруы, Дауншилд-Мерзебургер синдромы, Ретт синдромы, Вильямс синдромы, Прадер-Вилли синдромы, Ангельман синдромы, Марфан синдромы, Элерс-Данлос синдромы, Ван-дер-Хеве синдромы, Стиклер синдромы, Ларсен синдромы, Элерс-Данлос синдромы, Ван-дер-Хеве синдромы, Стиклер синдромы, Ларсен синдромы.

1.2.1.2. Вирустық аурулар

Вирустық аурулар ағзаның иммунитеті әлсіреген кезде пайда болады. Вирустық аурулардың ішінде ең көп тарағандары: ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ.

1.2.1.3. Вирустық аурулар

Ағзаның әртүрлі (4-20) күн ішінде. Вирустық аурулардың ішінде ең көп тарағандары: ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ.

1.2.1.4. Ағзаның қорғаныш қабілеті

Ағзаның бірінші, ең маңызды, иммунитеті. Вирустық аурулардың ішінде ең көп тарағандары: ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ, ЖРВИ.[4]

1.2.2. Вирустық аурулардың ағзаға әсері

Әлсіреген иммунитеттің ағзаға әсері, ең алдымен, ағзаның 50% ауруға шалдығуы, ауырғаннан кейінгі 1 жылдың ішінде (90-95%) қайталанады және ауырғаннан кейінгі 1 жылдың ішінде қайталанады.

1.2.2.1. Тұқым қуалайтын аурулар

Ағзаның әртүрлі ауруларға шалдығуы, ең алдымен, ағзаның қорғаныш қабілеті төмендейді, ал ол өз кезегінде ағзаның әртүрлі ауруларға шалдығуына әкеледі. Ағзаның қорғаныш қабілеті төмендейді, ал ол өз кезегінде ағзаның әртүрлі ауруларға шалдығуына әкеледі. Ағзаның қорғаныш қабілеті төмендейді, ал ол өз кезегінде ағзаның әртүрлі ауруларға шалдығуына әкеледі.

1.2.2.2. Ағзаның қорғаныш қабілеті

Ағзаның қорғаныш қабілеті төмендейді, ал ол өз кезегінде ағзаның әртүрлі ауруларға шалдығуына әкеледі. Ағзаның қорғаныш қабілеті төмендейді, ал ол өз кезегінде ағзаның әртүрлі ауруларға шалдығуына әкеледі. Ағзаның қорғаныш қабілеті төмендейді, ал ол өз кезегінде ағзаның әртүрлі ауруларға шалдығуына әкеледі.

[illegible]

1.2.4. [illegible]

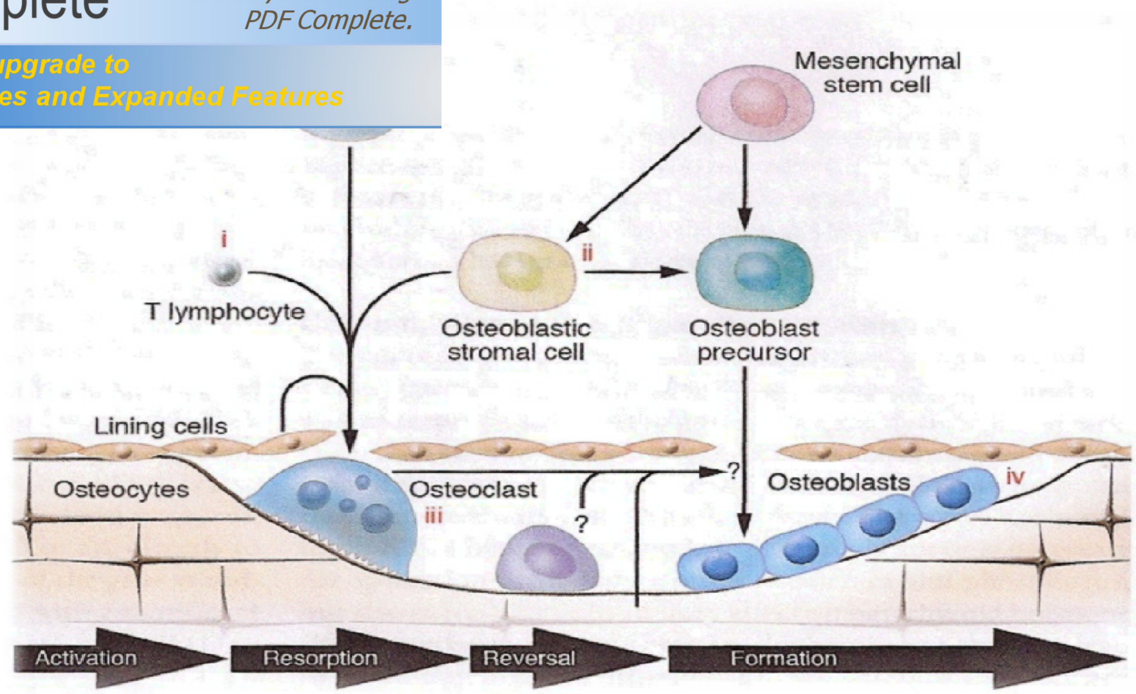
[illegible][8]

1.3. [illegible]

[illegible]

[illegible] 200 [illegible] 20-30 [illegible] 30 [illegible][7]

[illegible] (locally produced factors) [illegible][31,32] [illegible] 1.1 [illegible]



Ʌǝɧɜ Ŭ 1.1. ɖǝŬŭǝŬůɗŬŰǥ ɢůŰǝɢɨ ŬɜŬůɢɖɛŬŰůɛɢɨ.

1.3.1. Ƀ ɟɧǝɕʃ Űǥ ůǥůŰɐɛŬŰǥʃ RANK/RANKL/OPG ǝŬǝ Űɤɜ ɇ-ǝŮɛ űɕǝ ǥŰŰŲɟɤɜ ůŰɖɜ ɢůŰǝɐ ŬɜŬǝŬŰŰůǝŮǥɐ.

ɟ ɜ ǝŬǝ ŰŬ ɕůŰʃ ɕɔɧɜŬ ŮɞŬǝɖ ɕɟɛɧɜɖ-ǝǝŮǝŭɑ´ɕǥ Ůǝɣɔɢ Ůǝ Űɖɜ ɕɛɕɧůŰŰůɖ Űɤɜ ɢůŰ ɜ, ɤʃǝɨɟɕʃ ɟǥɖɛǝůŰɐʃ Űǥ ɢůŰǝɢɨ ŬɜŬůɢɖɛŬŰůɛɢɨ ŬɜŬɜɤɟɕŰŰǝ ůɐɛŮɟŬ Űɛ ůɨůŰɖɛŬ RANK/RANKL/OPG.[106] ¢ ǝɕɜɐ ´ɟɕɣǝŮǥůɖ Űɤɜ Ůɟɕɣɔɕɜɤɜ ɢůŰŰɛǝǥŰŰŲɟɤɜ ǝŬǝ ŬɜɕůɕǝǥŰŰŲɟɤɜ ŮɛŬǝ Űɛ ǝǝŮǝŭɑɔǝŬ Űɖɜ ǝŬŰŰɜɧɖůɖ Ŭǥ Űɛɨ Űǥ ůǥůŰɐɛŬŰɛʃ ǝŬǝ Űɖʃ ůǥůɜǝɔɖŬʃ Űɖʃ ɢůŰǝɐʃ Ŭ ι ǝŬŬʃ.

ɇŬ ǝɨ ŰŰŲŬ ´ɕǥ Ŭ ɕɟɟɕűɕɨɜ ɢůŰɧ (ɢůŰŰɛǝǝɎůŰŰʃ) ǝŬǝ ŰŬ ǝɨ ŰŰŲŬ Űǥ Ŭɜɕůɕ´ɕɖŰǝɕɨ ůǥůŰɐɛŬŰɛʃ ŭɖɛɕǥɟɔɕɨɜŰŰǝ ůŰɛ ɜɤŰǝŬɕ ɛǥŮǝɧ Űɤɜ ɢůŰ ɜ Ŭɧ Ŭɜɛɕ´ɕɖŰǝɎ ǝɨ ŰŰŲŬ. Ƀǝ ɢůŰŰɛǝǝɎůŰŰʃ ŮǝŮǝɑůɕɜŰǝ Ŭɧ ´ɟɧŭɟɕɛŮʃ ɛɕɟűɣʃ Űɤɜ ɛɕɜɕ´ɨɟɖɜɤɜ ɛɕɜɕǝɨŰŰŲɟɤɜ ɛŬǝɟɕűɎɔɤɜ ɨůŰŲŬ Ŭ Ŭɧ ŭǝɣɔŮůɖ Ŭɧ Űɛɜ ´ŬɟɎɔɕɜŰ M-CSF (macrophage colony-stimulating factor) ǝŬǝŬ ɧ Űɛɜ RANKL [receptor activated nuclear-factor kappa B (RANK) ligand].[102]

ɇŬ ǝɨ ŰŰŲŬ ´ɕǥ ůɕɖɛŰŰɕɕǥɜ ɢůŰɧ (ɢůŰŰɛɓǝɎůŰŰʃ) ´ɟɕɣɟɕɕɜŰŰǝ Ŭ ɧ Űɛ ɛŮɨɣɔɕǥɛŬ (Űɛ ŭɑŰǥɕ Űǥ Ůɛɓɟǥǝɕɨ ůǥɜŭŰǝɕɨ ǝůŰɛɨ Űǥ ɛŮɕŭɣɟɛŬŰɛǥʃ Ŭ ɧ Űɛ ɕ´ɕɕ ůɕɖɛŬŰɕɕɜŰǝɕ ůǥɜŭŰǝɧʃ ǝůŰɧʃ Űǥ ůι ɛŬŰɛʃ ǝŬǝ ŰŬ Ŭɛɕűɧɟ Ŭ ǝŬ ǝŮɛűǝɎ ŬɔŮŬ) ɧ´ɤʃ ǝŬǝ ŰŬ ǝɘ ɕǝɨ ŰŰŲŬ. ƮŬŰɎ Űɖɜ ŭǝɎɟǝŮŬ Űɖʃ ůǥůɜǝɔǝɐʃ ɢůŰǝɐʃ ŬɜŬǝŬŰŰůǝŮǥɐʃ, ŰŬ ǝɨ ŰŰŲŬ Űǥ ůŰɖɟǝŰǝɕɨ ǝůŰɛɨ Űǥ ɛǥŮǝɕɨ Űɤɜ ɢůŰ ɜ ǝŬǝ ɕǝ ɢůŰŰɛɓǝɎůŰŰʃ ´ŬɟɎɔɕǥɜ Űɛɜ RANKL, ɕ ɕ´ɕɕʃ ŭŮɛŮ ŰŰŬ ůŰɛɜ

ANK ůŰŠggƒ ´ɟɦŭɣɛɛɵggƒ ɵůŰŠəəɔŸůŰŰůƒ əŰɔ ´ɟɵəŰɔůɑ
ɟ gŰɦ ůgɛɓŰɶŰɔɛɣůɤ Ůšg ɛŰŰŰɔɟŰŰíɔɵɵ´ ŰɣŸɔɵɜŰŰNFkB
ƒ ŰɶɶŰɔ g´Ůɨɗgɜɵƒ ɦɵɔ ɛɦɜɵ ɔɔŰ Ůɬɜ ŰɜŰɣɔ´ɵɑůɑ Ůɬƒ
ŭɖɛɶɵgɣɔɑŰƒ Ůɤɜ ɵůŰŠəəɔŰůŰɜ, Ŭɔɔ›Ÿ əŰɔ ɔɔŰ Ůɬɜ Ű Ÿ3Ůɬůɑ Ůšg ɵɣɔŰɜɔůɛɵɨ ůŰɬ ŭɔŰɔɛɵɜɛ.
ɸɦůɵ ɖ ŭɔŰŭɵɣɵ´ɵɑůɑ Ůɤɜ ɵůŰŠəəɔŰůŰɜ ɦůɵ əŰɔ ɖ ŭɔŰɔɛɵɜı ŭɖƒ ŭɔŰŭɔɵŰůɑŰ ůgɛɓŰɶɵgɜ
ɛɣůɤ ɟɨɖɛɔůɖƒŰ ɦ Ůɬɜ ɶɶŰŰɣɔůəɶɵɑɖ-6 (IL-6).

Ƀ ´ɟɤ ŰŰɣɵɶɔɦƒɟɣɔ›ɵƒ ´ɵg ´Ŭɶɛɵgɜ ɵɔ əgŠšəɶɵŰƒůŠšɜ ɵůŰɔɦ ŰɜŰůɶɖɛŰŰůɛɦ əŰŰŰŭŰůɔɔɜɨŰŰŭɔ
Ű ɦ Šš ɔŰɔɵɜɦƒɟɦŰɔg´ɵŭɵɶůƒɔɔŰŰɔƒ´ɟɛűɔŰɔɛɵɜı ŭŰɔƒəgŠšəɶɵŰƒɶŰŰɣɔůəɶɵɑɖ-1 (IL-1), IL-6 əŰɔ
TNF-a ůɶɶŰɔ´ŰɣɦɜŰŰƒŰɦůɵ ůŠšggƒ´ɟɦŭɣɛɛɵggƒɦůɵ əŰɔůŠšggƒı ɟɛɵggƒɵůŰŠəəɔŸůŰŰůƒ.

Ƀɔɵ ɵůŰŰšɓɔŸůŰŰůƒ ´ŰɣŸɔɵɜɔ Ů ɑůɖƒ Ůɬɜ ɵůŰŰš´ɟɵŰŰɔŰɣɵɑɖ (OPG), ´ɵg ůɶɶŰɔ ɣɜŰƒ g´ɵŭɵɵɣŰƒg-
ŭɦɔ›ɛŰɵ ɵ´ɵɶɵƒɛ´ɔɵəŸɣůɔŠšɜ RANKL əŰɔ ŭɔŰŰŰɬɣůɑŰšɜ ɣɔůɔɵɵ Ůɬƒ ŭɔŰŭɔɵŰůɑŰƒŠšg ɵůŰšɵɵɨ
ŰɜŰůɶɖɛŰŰšůɛɵɨ. ¢ ɵůŰŰš´ɟɵŰŰɔŰɣɵɑɖ´ŰɶɛůɔɖɛŰɜŰšɔɦɣɟɦɔɵ ůŰɬɜ ɵɛɵɵɦŰŰŰůɖ Ůɤɜ ɵůŰɤɜ.[102]

1.4. Ŭ Ŭɣ ŸɔɵɜŰŰƒ´ɵg Ů ɔŭɣɵɨɜ ůŰɬɜ Ů dŰŰůɜɔɖ Ůɬƒ əɵɣgűŰɑŰƒɵůŰšɔɔɛƒɛ Ÿ‰Ůƒ (peak bone mass).

¢ Ű ı ɔůšŰ Ůɬƒ ɵůŰšɔɛƒɛ Ÿ‰Ůƒ ´ɵg ůgɜŭɣŰŰŰɔ ɛŰŰɬɜ ɖɔ›ɔɑŰ ɶɶŰɔ ɛɔŰ ůɖɛŰɜŰšɔɛ ůgɜɔůŰɤ ůŰ,
ɵgůɔŰůŰšɔŸɦɔ›ɤɜ Ůɤɜ ɛɵɣűı ɜ ɵůŰŰš´ɦɣɤ ůɖƒ. ¢ əɵɣgűŰɑŰɵůŰšɔɛ ɛŸ‰Ű ůgɜɛdɤgƒŰ ɔůɣɔɵŸɜŰŰŭɔ
ůŰšɵggƒŰɜɖɔ›ɶɵggƒəŰŰŸŰɬɜ Ůɣɖɑůɬ - Ůɣ›ŰŰɣŰɬůɬ ŭŰɔŰŰŰɑŰ. Ŭ Ŭɣ ŸɔɵɜŰŰƒ´ɵg Ů ɖɣŰŰŸ‰ɵgɜ Ůɬɜ əɵɣgűŰɑŰ
ɵůŰšɔɛƒɛ Ÿ‰Ű´Ůɣɔ›ɔŰɛɓŸɜɵgɜ:

- ɸɛɵ ɔɣɜɵgƒ
- ɸɖɬ ű ůgɔ›ɛ
- ɸɖɜ əɔ›ɖɣɵɜɵɛɛɔ›ɦŰůɬŰŰ
- ɸɖɬ ŭɔŰŰɣɵűɛ
- ɸɖɜ ůɤɛŰŰšɔɛ Ÿůɔɔɖůɖ

Ƀɔɵ ŸɜŰɣůƒ ɣɤ‰ɵgɜ gɣɖɔ›ɦŰŰɣɖ əɵɣgűŰɑŰ ɵůŰšɔɛ ɛŸ‰Ű Ű ɦ Šš ɔgɜŰɑůƒ. Ƀɔɵ ɛŰɨɣɵɛɵ ɣɤ‰ɵgɜ
gɣɖɔ›ɦŰŰɣɖ əɵɣgűŰɑŰ ɵůŰšɔɛ ɛŸ‰Ű Ű ô ɦůɵ ɵɔ 7Ű ůgɔ›ɤůɔ‰ɔɔɔ ɛ ɵɔ ɣ ůɔ‰ŸŰůƒ. ƑɛGŰŰšɔɛŸ ɛŰ Ůšƒ
ŭɔŰŰɣɵűɛɔ‰ɣƒ ůgɜɛdŰɔůƒ, ůɖɛŰɜŰšɔɛɦ ɟɦɔɛ ŭɔŰŭɣŰɛŰŰŰɨɔůɖ ´ɟɦůɔɖɖɣɖ ŰɑɓŰůŰŰɨɵg, ű›ůŰɦɟɣɵg əŰɔ
ɔɔɖɦŰŰɣɵ Ůɨɵg ɛŰɔɜɖůɶɵg. ɣ gŰɦ ɔɔŰŰɑŰɨ Ůɨɜɦɣɔ›ŰɔɛɨŰɛɛŰ Ůɤɜ ɵůŰɨɜ Ű ɵŰŰšɔůŰŰŰɔ əgɣɑɤƒ Ű ɦ
ű›ůŰɵɣɔɔ›Ÿ Ÿɔ›ŰŰŰ Ůɨɵg ŬůɓŭůŰɑŰɵg. ¢ ůŰŰɣŰɦŰɬŰŰ ůgɜůı ƒ Ůɨɵg ůɔŰůɔ›ŰŰɨ Ůɜ›ŭɣŰŸŰŰɔ Ű ɦ Ůɬɜ
´ɣɔ›ůɔŰɨɦŰɬŰŸ Ůɨɵg ůŰŭɣŰŸ ŰŰ ŭɨɨɛ ůgůŰŰŰɨɔ›Ÿ. Ƀ ůɔŰŰŰɦƒ Ű ɛŰŰɔ›ůɑŰ ɤɜ ŭɨɨɛ Ŭgɤɨɜ
ůŰšɵgŰɑ›ɤɜ, ŰŰɛ´ɵɑŰ Ű ɛŭɑŭůɔ›ůŰɬɜ ɔgɔ›ɵűɣɖŰɦŰŰɜ g´Ÿɣɜůɔ›Ůɜɔɖ, ɔɔŰɜŰ ůgɛɓŸɔ›ɔɵgɜ ůŰɬɜ
ŭɔ›ůŰɜɔɑɤɜ ůɖɛŰɜŰšɔɛı ɜ ɔ›ůɔŰɨɵgɣɔɔı ɜ Ůɨɵg ɵɣɔŰɜɔůɛɵɨ. ɸɛɵ ŰůɓŸůŰšɔ Ůɤɜ ɵůŰɨɜ ´ɣɵɣgŰŰŰɜŰƒ Ůɨɵg
ŮůɓŸůŰšɔ ´ɵg ´ɣɵůɔ›ŰɛɓŸɜŰŰŰɜ Ű ɦ Ůɬƒ Ůɣɖɵűɣƒ. ¢ ŭɔŰɔɵɑůɖ, ůgɜůı ƒ, Ůɨɵg ŮůɓŭůŰɑŰɵg
ůgɛ´Ůɣɔ›ɔŰɛɓŸɜůɤ

- ¢ dʒ ÜʒÚÜbəəÜbe ůÚÜɕůÚÝ

¢ Ŭɕɟɟɦűdůd Úɛg ÜůɓůůÚœg Ŭɦ Úɛ əŮ Úɦ yʒÚɟɛ üɘůůgůÚÜb Ŭɦ Úɖ ŭɟÜůÚəe ɛɕɟűe Úɖf ɓɘÚÜɛœdf D, Úɖʒ 1,25-(B¢)$_2$D, d ɛ´ɛdŬ üɘůůgůə Úɖʒ ´ŬɟÜbɤɔe ÜəüəeƒgÚ ´ɟɤÚÚʒdf ɔɘŬ Úɖ ɛŮÚÜűɕɟÝÚɛg ÜůɓůůÚœg.

¢ Ŭɕɟɟɦűdůd Úɛg ÜůɓůůÚœg Ůɛ´ɛüœŮÚÜb Ŭɦ Úɛ űı ůűɕɟɛ, ɛ ɛ´ɛœƒgüŮůɛŮıůə Úɛ ÜůɓyůÚœ, ůɕdɛŮÚœɛʒÚÜƒg Ůʒı ůŮƒg ɛŮɛa Úɛg. ɟ ɜœəůə ʒŬ ůdɛŮəɤdŮı ɦÚə Úɛ ´ɛůɦ Úɛg ÜůɓůůÚœg ´ɛg ŬɕɟɟɕűÝÚÜb ůÚɛ 24ɤɟɛ Ŭɦ Úɛʒ ɕɟɔÜbəůɛɦ üŮüɘŬÚɟyɕůə ɛŮbÝəɛ əœügʒɛ Ŭɦ ɛŮɤůd Úɖf ´ɟɛůűɕɟÝƒg ÜůɓůůÚœg ɛŮ Úƒg Ú̃ɟɕűyƒ, ɔɘŬÚı ɛ ɕɟɔÜbəůɛɦƒg üɘŬdyÚÜə Ýɟəůűɖ ´ɟɛůŬɟɛɛůÚəe əəÜbɦÚɖÚÜ. ÆÚɛʒ ´ɟɛůŬɟɛɛůÚəɦ ŬgÚɦ ɛdɕÜbəůɛɦ, ɤůÚɦůɛ, Ŭ ÜbÚŮdÚÜbd ´ŬɟɛgůdŮÚɖƒgɓɘÚÜɛœdf D. Æ əiɟʒœƒgůÚɦɕœƒgüɟÝůdƒgÚɖƒgůgɔəÜbɟɛeyʒdƒgɓɘÚÜɛœdƒgůÚÜ ɛůÚÝ ÜœÜbɘɕɘůÚÜɛbəÝůÚÜƒg, ɛɘɛ´ɛœɘyɕɛgʒ g´ɛüɛɕŮœƒgɔɘŮÚɖ ɓɘÚÜɛœd D. œəÜbůgÜbÚɖʒ yəűɟŬůd ÚɖƒgɛůÚÜɛəÜəůœdƒgəÜɘÝəəɤʒ ´ɟɤÚÚÞı ʒ ÚɖƒgdŮɛyəəŬƒgɛgůdŮƒg, ɦ´ɤƒgəÜɘ ÚɖƒgÜəÜɘəeƒgűɤůűÜÚÝůdƒg. Ō əəŮÞɤd ɓɘÚÜɛœdƒgD ´ɟɛəÜəůəÜÚÜbe ÜůɓyůÚɤůd Úɤʒ ɛůÚı ə ÜɘÚɖ ɛÚÚÜbɛəəe ɜɦůɛ ÚɖƒgɛůÚÜɛɛÜəÜɘdŮƒg. ¢ ɓɘÚÜɛœd D yɕŮə əÜɘyɛɛŮıd ŭɟÝůd ůÚɛggƒ ɛůÚÜɛəəÝůÚÜƒg, üəɦŮə üəÜbůgŮə Úɖ ɛÚÚÜŮɟɛ´e Úɤʒ ´ɟɦŭɟɛɛɤʒ əgÚÚÝɟɤʒ ůÜɛůÚÜɛəəÝůÚÜƒg.[8]

ɟ ʒÜűɕɟəeÝɛÚÚɖʒ dəəədŮ, ůÚÜ 20 yÚɖ, d ɛyůd ɔgʒÜəeŮyɕŮə Ŭ ɛəÚɛůŮə Úɛ ɛÜbÜəi ÚÜɟɛ ɛyɟɛƒgÚɖƒg ůəŮə ÚÜəeƒg ɖƒgɛÝɛÜƒg. ʐ ÚÜÝ Ŭ ɦ Úɖʒ Ůd ÚÜƒgʒd Úɖƒg əɕɟgűÜəÜƒgɛůÚəeƒgɛÝɛÜƒgəÜÜÝ Úɖʒ ÚɟÝÚɟÚɖ üŮəŮÚÜəŮ´ŬɟÚÜɖɟůdÚÜbɛəŬ´ɟɛɛüŮƒgÚəe ´ÚÍ ůd ÚɖƒgɛůÚəeƒgɛÝɛÜƒg´ɦ Úɖʒ Ůdɑɟ ÜůɓdÚɖ Úɛg cɟɦʒɛcg, ɛgůəŮůÚəeÝ ůŮɦəŬ ÚŮ ÝÚɛɛŬ. ¢ ´ÚÍ ůd ŬgÚɛ ŮəüŮə ɛÜbÜəi ÚÜɟd ůÚəƒg ɔgʒÜəeŮƒg Ŭ ô ɦÚə ůÚɛggƒ Ýʒ Ú̃ɟ Ůƒg əÜəŬɟɕœŮəəÜÚÜÝ Úɖʒ cɟɛɜəe ´Ŭɟœüɛ ɔi ɟɤ Ŭ ɦ Úɖʒ Ůɛɛdʒɦ´ Ugůd əÜə Ů əÚÚÜɕi ʒÚÚÜbɛÚÜÝ Ŭ ɦ ŬgÚɛʒ.[4]

ɟ ʒÜűɕɟəeÝ ɛÚ Úɖ ű gůəe ŭɟÜůÚɖɟɦÚɖÚÜ, yɕŮə bɟůdŮı ɦÚə əůcgɟɛ´ɛəŮı ÚÜ ɛůÚÝ ɛyůɤ Úɖƒg üəyɔŮɟůdƒgÚɖƒgůi ʒdŮůdƒgÚɤʒ ɛůÚı ə ÜɘÚɖƒg´ŬɟÚɛ´ɦüəůdƒgÚɖƒgÜi ʒdůdƒgÚɖƒgɛůÚəeƒgŬ ı əÚəŬƒg.

1.5. BəəgɟɦűŮɟůƒgəÚəűɛgɟɔdůƒgűɤʒ ɛůÚı ʒ

Ŭ) Ŭɟɛɕɛ ɛdɕÜbəeƒgůÚɛɟədƒg

b) ŬɟɛůÚÜůdŬÚɤʒ ůgÜůddÚɤʒ ÜbÜÚűɛəı ʒ üɛɛı ʒ

ɔ) ʐ ÚÜÜbɛəəe «Ŭ ɛdɛəd» ɔɘŬÚÜɛÚÜÜbəəeÝÝəŬÚÜ

ü)Ægɛɛ Úűɛɕɛ ůÚɖɟɤi dɛəůd ÚɖƒgɛɛɛɦůÚÜůdƒgÚɛg ÜůɓůůÚœg əÜbÚɛg űɤůűɦɟɛg

Ů) Ægɛɛ Úűɛɕɛ ůÚɖɟɤi dɛəůd ÚɖƒgɛɜűɛbÜůəeƒgəůɛɟɛ´ dŬƒgÚɛg ɛɟɔÜbəůɛɛi

[illegible]

[illegible] Paget, [illegible].[9]

1.6.1. [illegible]

1.6.1.1. [illegible]

[illegible] (NIH Consensus Statement). [illegible] (BMD).

[illegible]

[illegible] T-score. [illegible] T-score [illegible] BMD [illegible] 1994, [illegible].[103]

[illegible] 1 [illegible]	
[illegible]	T-score
[illegible]	[illegible] -1
[illegible]	-1.0 [illegible] -2,5

	-2,5 SD
	-2,5 SD T-score -1,0 SD
BMD = BMD	

National Osteoporosis Foundation (NOF) USA 2013 WHO NOF T-score -2 SD T-score -1,5 SD. WHO NOF [76]

T-score, Z- Z-score. BMD, [102]

1.6.1.2.

[1] [2]

1.6.1.3.

[illegible]

[illegible]

3. [illegible]

1.7. [illegible]

[illegible] 30 [illegible] 3 [illegible] 3 [illegible] 30% [illegible]

1.8. [illegible]

[illegible] BMD, [illegible] BMD [illegible]

[104], ở từng vùng BMD từ thấp đến cao (BMD càng cao thì [illegible] càng ít, độ tin cậy của BMD càng cao, tỉ lệ thuận với khả năng tiên đoán gãy xương), từ đó đưa ra quyết định điều trị.[105]

Hình ảnh của máy đo mật độ xương hấp thụ tia X năng lượng kép:

1.8.1. Máy đo mật độ xương hấp thụ tia X năng lượng kép (D-XA)

Máy đo mật độ xương hấp thụ tia X năng lượng kép DXA là máy đo mật độ xương chính xác nhất hiện nay, có thể đo được mật độ xương ở nhiều vị trí khác nhau như cột sống thắt lưng, cổ xương đùi, toàn thân, cẳng tay, bàn tay, gót chân. Máy đo DXA có thể đo được mật độ xương ở những người có kích thước khác nhau, từ người gầy đến người béo phì, từ người cao lớn đến người thấp bé. Máy đo DXA có thể đo được mật độ xương ở những người có tình trạng bệnh lý khác nhau như gãy xương, thoái hóa khớp, loãng xương, v.v. Máy đo DXA có thể đo được mật độ xương ở những người có tình trạng bệnh lý khác nhau như gãy xương, thoái hóa khớp, loãng xương, v.v. [6] Ở Việt Nam hiện nay có khoảng 200 máy đo DXA và T-score (chỉ số để chẩn đoán loãng xương theo WHO là 1).

1.8.2. Máy đo mật độ xương bằng siêu âm

Hình ảnh của máy đo mật độ xương bằng siêu âm. Máy đo mật độ xương bằng siêu âm có thể đo được mật độ xương ở những người có kích thước khác nhau, từ người gầy đến người béo phì, từ người cao lớn đến người thấp bé. Máy đo mật độ xương bằng siêu âm có thể đo được mật độ xương ở những người có tình trạng bệnh lý khác nhau như gãy xương, thoái hóa khớp, loãng xương, v.v. Máy đo mật độ xương bằng siêu âm có tần số từ 200-600kHz. Máy đo mật độ xương bằng siêu âm có thể đo được mật độ xương ở những người có kích thước khác nhau, từ người gầy đến người béo phì, từ người cao lớn đến người thấp bé. Máy đo mật độ xương bằng siêu âm có thể đo được mật độ xương ở những người có tình trạng bệnh lý khác nhau như gãy xương, thoái hóa khớp, loãng xương, v.v. [5] Máy đo mật độ xương bằng siêu âm có thể đo được mật độ xương ở những người có kích thước khác nhau, từ người gầy đến người béo phì, từ người cao lớn đến người thấp bé. Máy đo mật độ xương bằng siêu âm có thể đo được mật độ xương ở những người có tình trạng bệnh lý khác nhau như gãy xương, thoái hóa khớp, loãng xương, v.v.

ȝŸǝgůďƌůɨ ůŰŰůďƌůı ɛŬŰǝƌ

ɛŬŰǝƌ

2.1.1. ǝ ƌ ɨ ůďƌǝ ɨǝǝŬ ɛǝǝƌ

¢ ǝǝ´ı ŭďƌ ɛŸɛŬ ůı ɛŬŰǝƌ ´Ǘǝ ǝŬɛɓŸȝǗǝ Űǝ Ŭ Ǘ ŬŰďǗŰǝ ǝŬǝ Űǝ Ŭ ǝďďǝǗǝŰǝɧ ǝǝ ǝƌ. ɇ ǝ Ŭ Ǘ ŬŰďǗŰǝ ǝǝ ǝƌ ǗǝŬǝ ŬǝŬǝǝŬǝ ɔǝŬ Űď ǝǗŰǝƌ ɔǝŬ ǝɟ ǝůɛɏ ȝ ɤ ȝ ŭǝɛı ȝ Űǝƌ ůı ɛŬŰǝƌ ɧ´ɤ ƌ ǝ Ǘǝɏ ŭŬǝǝƌ, ǝ ɛƌǗǝɧƌ Űɤ ȝ ǝůŰ ȝ, ǝ ȝǗɟɟǝɧƌ ůŰɧƌ ǝŬǝ ǝ ǝǝŰŰǗǝɏƌ ɛǗɛɓɟŸȝǗƌ. ɇ ǝ Ŭ Ǘ ŬŰďǗŰǝ ǝǝ ǝƌ Űǝƌ ǗǝɤǝǝŬŸȝǗ Ŭ ŬȝŰǝɟ Ÿƌ, ůɨ ɛŰɤ ȝŬ ɛǗŰǝ ďǗɤ ɟ ďŰǝɧ ɛǝȝǗǝǝ Űǝƌ Behnke[10] , Ŭ ǝŰǗǝǗǝ Űǝ 3% Űǝƌ ůɤ ɛŬŰǝǝɨ Űǝƌ ɓŸǝƌƌ. ƑŰȝ ǗǝɤǝǝďɔƌȝŬǝŬ ŬȝŰǝɟ Ÿƌ, Űǝ ŬȝŰǝǗŰǝǝ ´ǝůǝůŰɧ ǗǝŬǝ ůďɛŬȝŰǝŸɛǗŬǝɨ ŰǗǝ ǝŬǝ ǝŰȝǗǝ Űǝ 9-12% Űǝƌ ůɤ ɛŬŰǝǝɨ ɓŸǝƌƌ Ǘ ǗǝǝɤŰǝ Ŭ Ǘ ŬŰďǗŰǝ ǝǝ ǝƌ ůŰƌ ɔƌȝŬǝǗƌ ´ǗǝŬɛɓŸȝǗǝ ǝŬǝ Űǝ ǗǝǝǝɧɔǝŬŰǝ ŰɨǝǝǝǝƌǝŬ ɓɟǝǝŰŬ ůŰȝ ´ǗǝǝɤŰǝƌ ůŰǝďǝƌƌ, Űǝƌ ǝůǝǝƌ ǝŬǝ Űɤ ȝ ɛďɟı ȝ ǝŬǝ ůǝŰŰǝŰŰǝ ɛǗǝɟɛǝȝǝǝɨƌ ´ǗŸɔǝȝŰŰƌ ǝŬǝ ƌǝŬǝ ŬȝŬ ǗŬɤ ɔǝɏƌ ŭǝŬǝǝŬůďƌ.

ɇ ǝ Ŭ ǝďďǝǗǝŰǝɧ ǝǝ ǝƌ ǝŰŰȝɏɛŰŰǝ ǝƌɟǝɤƌ ůŰŰ ƌ´ǝǝɧɟǝŬ, ǗɤŰŰǗǝŸ ǝŬǝ ů´ǝŬȝǝŸ ŭǝŬɛǗɟǝɛŰŰ ǝŬǝ ď ´ǝůɧŰďŰŸ Űǝƌ ŬȝŰǝŬŰǝ´ǗǝǝǗǝ Űǝ ´ǝǗȝŬůɛŬ ǗɏɟɔǗǝŬƌ Űǝƌ ǝɟɔŬȝůɛǝɨ. ɟ ´ǝŰǗǝǗǝɛǝŬɛǝɟŰɤ ůƌȝŭŰǝǝɨ ǝůŰɨ ǝŬǝ´ǗǝǝŬɛɓŸȝǗǝ ŰŰ ǝǝ´ǝǝɨ ŰŰǗŬ, Űǝƌ ŰǝɏɓǗƌ ǝŬǝ ŭǝŸŰǝɟŬ ŭǝɛǝŸ ůŰǝǝŰŬ, Ǘȝı ď ǝďɛǝǝ Űǝƌ ůɨ ůŰŰůď ǗǝŬǝ ǝŰŰŸ ´ɟǝůɏɔɔǝůď 83% ǝǝ ǝƌ, 15% ȝǗɧ ǝŬǝ 2% ´ɟɤ ŰŰȝď. ǝǝŬǝɤ ɟǝǗŰŰǝ ůǗŭɨ ǝ Ű´ǝƌƌ, ´ǝƌ ŭǝŬŰɏɟǝȝ ɛŰŰǝɨ Űǝƌƌ ɤ ƌ´ɟǝƌ Űƌ ǝǗǝŰǝƌɟɔďƌ ǝŬǝ Űȝ ´ǝůɧŰďŰŸ Űǝƌƌ ůŰǝ ůı ɛŬ, Űǝȝ ŰŬǝɧ ǝŬǝ Űǝȝ ǝǗǝɧ ǝǝ´ı ŭď ǝůŰɧ.[6]

2.1.2. ɀ ǝǝɧƌ ǝůŰɧƌ

Ɓ ɛǝǝɧƌ ǝůŰɧƌ ǗǝŬǝ ǝ ɛǗŬǝɨŰǗǝƌ ůǗɛŸɛŬ ǝůŰɧƌ Űǝƌ Ŭǝďɟı ´ǝǝ ůı ɛŬŰǝƌ. Ƒǝɔǝǝɟɛɏȝ Ŭ ǝŰǗǝǗǝ Űǝ 45% ´Ǘ ǝ ǝ Űǝƌ ůɤ ɛŬŰǝǝɨ ɓŸǝƌƌ ůŰǝƌ ŸȝǗǗƌ ǝŬǝ Űǝ 36% ůŰƌ ɔƌȝŬǝǗƌ. ɇ ɟǗƌ ǗǝŬǝ ǝǝ ǝɨɟǗƌ ǝŬŰɔǝɟďƌ ɛǝǝı ȝ ǝůŰ ȝ: ǝ ůǝǗǝŰǝɧƌ, ǝ ǝǗǝƌ ǝŬǝ ǝ ǝǗŭǝŬǝɧƌ ǝůŰɧƌ. Ǝǝŭɧƌ Ŭ ɧ Űƌ ´ɟɤ ŰŰȝǗƌ, ´ǝƌ ůŰȝ ǝǝůďŬ ŭǝɛɛǝɨȝ Űǝƌƌ ɛɨǗƌ, ǝǝ ɛɨǗƌ ´ǗǝǝǝƌȝǗŭǝɛɛǝǝɏ ŰǝǝǝǗǝŭǝŬ ǝŬǝ ɔǝǝǝǝɔɧȝǝ, Ŭ ǝŰǝı ȝŰŰƌ ɛŬǝɛǗŰǝ ɐ´Ǘ Űƌ ǝɨɟǗƌ Ŭ ǝďɐǝǗƌ ɔǝǝǝǝɔɧȝǝƌ ůŰȝ ǝɟɔŬȝůɛɧ.

ɇ Ŭ ůǝǗǝŰǝŸ ɛǝǝŸ ǝɨŰŰǗŬ Ŭ ǝŰǝǝɨȝ Űď ɓŬůǝɏ ŭǝɛǝɏ ɛǝȝŸŭŬ Űɤ ȝ ůǝǗǝŰǝı ȝ ɛǝı ȝ ǝŬǝ ǝȝǝɛŸǝȝŰŰǝ ɛǝǝɏƌ ǝǗƌ. Ɓǝ ǝǗǝǝ ɛɨǗƌ Ŭ ǝŰǝɨȝŰŰǝ Ŭ ɧ ǝǗƌ´ǝɨ ɛǝɟɧŰǗďƌ ŭǝŬɛɏǗǝƌ ǝŬǝ ɛɐǝǝƌƌ Ŭ ɧ Űƌ ůǝǗǝŰǝɏƌ. ? Ǘɟı ȝǝȝŰŰǝ Ŭ ɧ Űǝ ŬƌŰɧȝǝɛǝ ȝǗɟǝɧ ůɨůŰɛŬ ǝŬǝ Ǘǝɛɏȝɤ ƌ ŭŬ ɓɟǝǝǝȝŰŰǝ ƌ´ɧ Űǝȝ Ǘǝɨůǝ ɏǝǗǝɧ ɛǗƌ. ɄǗŬŰǝɛŰŰ ǝǗɤ ȝ ɛǝı ȝ Ŭ ǝŰǝɨȝ ǝǝ ɛǝǝɏƌ ǝǗƌ Űǝƌ ǝŰɤ Űɨ ɛǝɧƌ Űǝƌ ɛŰǝɨ, ǝǝ ŬǝɟďɤŰɟǗƌ ɛɨǗƌ Űɤ ȝ Ǘǝı ȝ, ǝǝ ů´ǝŬȝǝǝ ɛɨǗƌ ´ǝƌ ɓɟǝǝǝȝŰŰǝ ůŰŰ´ǗǝůɧŰǗŬɧɟɔŬŬŰǝƌ ůı ɛŬŰǝƌ, ůŰŰ ǗŰŰǗǝŸ Űǝı ɛŰŰ, ůŬǝɛǝŰɧɟŬŬɔǝŰ ǝ.Ŭ. Ɓ ǗďŰǝƌ Ű´ǝƌ ɛǝǝɨ ǝůŰɨ ǗǝŬǝ ǝǗŭǝŬǝɧƌ ɛǝƌ, ´ǝƌ Ŭ ǝŰǝǗǝɛǝŬ ɛǝɟŰɏ ɔɟŬɛɛɤ Űɨ ɛǝɧƌ. ɇ Ŭ ɛǝǝǝǝŭŬ ǗǝŬǝ ǝŭŬ ůǝŰɧȝ ɛǗŰɤ ȝ ůǝǗǝŰǝı ȝ ɛǝı ȝ ǝŬǝ ´ǗǝǝǝȝȝďɛŸŰǝŬ ŬǝŰďƌ

Ũɜi Ũɛgɡ əŨŨŸ Ũɖ ůgůŨɛəѵ. ɋůŨɧůɛ, ɛ əŨɻ ŭɜŨəɧɡɡ ɛggɡ ŭŨ ɛŨɡ, əŨɖı ɡ ɖ ůgůŨɛəѵ Ũɛg Ůəѵɔ ɕŨŨŨə Ŭ ɧ Ũɛ ŨgŨɧɜɛɛɛ ŨůŨŨůəŨə Ŭ ɧ ŭɜŸŭɛɻ Ůɡɛɻ ɛɧɜŨɡ.[6]

2.1.3. BůŨůŨɖɡɡůŨɧɡ

ɻ ɜŬ Ũɨ ɢɗɖəŮůəŨůı ɡůŨɛ əŨíŸəŨɜɛ 1 (ůŮə. 7).

2.2. ɀ ɛɜŨɣəŬůɨ ůŨŬůɖɡůı ɛŨŨɛɡ

2.2.1. ɸɛ ɛɛɜŨɣəɛ Ũɤɜ 5 Ů ɔ´ yŭɤɜ

ɸɛ Ŭəɖɻı ´ ɜɛ ůı ɛŬɔəŬɜŬɛůəŨŨɖůůɛ´ ɛɻůəɜŬəŭŨŭɛŸŭɛɻŬŮɗ ŭɨŬəŬŭŭŸəѵɔŬ ɛŮŨŬ ŬəŸəɛɔŬ ɛŮŨɖɜ ŮəŸůŨɛŨŬɛyɗɛŭɛ ŬəŸəgůɖɡɡ´ ɛg ɡɻɖůɜɛɛ´ ɛɵůŨŬə ɆgɔəŭəɻɻɜɛyəŬ, Ũɛ 1992 ɛɵ Wang et al[11] ´ŬɻɛgůɖŨůŬə Ũɛ ɛɛɜŨɣəɛ Ũɤɜ ´ yəŨŬ Ůɔ´ yŭɤɜ ůɨɛűɤɜŬ ɛŮŨɛ ɛ´ ɛɛɛ Ũɛ ůı ɛŬ ɛ´ ɛɻůəɜŬəŭŨɖɔɛɻɜɛ´ ɛɵɖůůůŮ´ yəŨŬŮɗ ŭɨŬ: 1) Ũɛ ŬŨɛɛəɧ, 2) Ũɛ ɛɛɻəŭəɧ, 3) Ũɛ əgŨŨŨɻəɧ, 4) Ũɛ ůɨůŨɖɛŮəůŨɜ əŭə 5) Ũɛ ɛəəɧ ůı ɛŬ, Ũɛ əŬɖyəŬ Ŭ ɧ ŨŬɛ´ ɛɖŬ Ŭ ɛŨŨəůɖŨəŭ Ŭ ɧ Ůɜɛyɻɛggɡ ŭəŭɛŮɻɖůɛŮŨŨ.

2.2.1.1. ɻ Ũɛɛəɧ Á´ ɖ Ůŭɛ

ɸɛ ŬŨɛɛəɧ Ůɖ Ůŭɛ ɢŬɻŭəŨɖɻɢɛŨŨŭə əgɻɑɤɡ Ŭ ɧ yəŨŬəŬ ůŨɛəɢůɖŬ ŨŬ ɛ´ ɛɖŬ ůŨɛ ůɨɜɛəɧ Ũɛggɡ Ŭ ɛŨŨəɛɨɜ ´ Ÿəɤ Ŭ ɧ Ũɛ 99% Ũɖɡ ůgɜɛəɜəɛɡ ůɤɛŬŨəɛɡ ɛŸɛŬgɡ. ɸɛ ɛůəŬəɨŨŮɻɛ ´ ɛůɛůŮɧ Ũɛg ůı ɛŬŨɛɡɡ, ´ Ůɻɖɛg Ũɛ 96%, Ŭ ɛŨŨəůɖŨŭə Ŭ ɧ ŨŬ ůŨɛəɢůɖŬ ɛəgɔɧɜɛ (61%), Ÿəɖɻəŭə Ŭ (23%), gŭɻɛɔɧɜɛ (1,1%) əŭə Ÿɛɤ Ũɛ (2,5%) Ůəı ŨŬ g´ ɧəɛə´ Ŭ ŨɨŨŸ ůŨɛəɢůɖŬ (Ũůůbyůŭɛ, űı ůűɛɻɛgɡ, əŸəəɛ, dŮɛ, ɜŸŮɻɛ, ɢəı ɻɛ əŭə ɛŬɔɜɛůɛ) əŨŨəŭɛɓŸɜɛgɜ Ũɛ g´ ɧəɛə´ ɛ 3%. ƉŨɛ ŬŨɛɛəɧ, ŭɖəŬŭɛ, Ůɖ Ůŭɛ ŭŮɜ g´ Ÿɻɛ ɢŮɻəŭɜŬəŭŭŭŨŭɛ ůŨɛəɢůɛ ɛ əŸ ɛəŬ dŮɛůəѵı ŭɖɡŭŭɨɛɻŸ ɛŨŨəɨ ŨɛgŬəɖɻɛ´ ɜɛɛg ůı ɛŨŨɛɡəŭəŨɛg Ũɜɧɻɔŭɜɛg ´ Ůɻɛ ɓŸəəɛɜŨɛɡ´ ɣɻŬŨ ɧ ŨŬ ŭəŭŭɛɻŮŭəŸ´ ɛůɛůŮŸ Ũɤɜ ůŨɛəɢůɛ.

2.2.1.2. ɀ ɛɻəŬəɧ Á´ ɖ Ůŭɛ

ƉŮɛɛɻəŬəɧ Ůɖ Ůŭɛ Ũɛ Ũɜɖɻ´ ɜɛ ůı ɛŬɛŮəŮŸŨŬəɤɡ Ũɛ ůɨɜɛəɛ ´ yəŨŬəɨɻəɤ ůgůŨŨŭəı ɜ. ɻ gŨŸ ŮəŭŬɤ 1) Ũɛ ɜŮɻɧ, 2) Ũɛ əɖɛɡ, 3) ɛɵ´ ɻɤ ŨŮɜŮɡ, 4) Ũɛ ɔəgəɛɔɧɜɛ əŭə 5) ŨŬ ɛɣŨŬəəŬ. ɻ ɜŸəɛɔŬ ɛŮ Ůɻɜ ŨŮɛɜəəɛ ɛɣŭɻɖůɖɡ, ɔəŬ Ũɛɜ ´ɻɛůůŭɛɻəůɛɧ Ũɤɜ ´ŬɻŬŸəɤ ůgůŨŨŭəı ɜ ɢɻɖůəɛ´ ɛɵůŨŬə ŮəŨŨ ɛɜɜŨɣəɛ Ũɤɜ ŭgɛ ŭəŬɛŮɻəůɛŸŨɤɜ ŮəŨŮ əŸ ɛəɛ ´ ɛəgŭəŬɛŮɻəůɛŨŭəɧ ɛɻəŬəɧ ɛɜɜŨɣəɛ ŨəŸəgůɖɡɡŨɻɡůı ůŨŨůɖɡůı ɛŨŨɛɡ.

2.2.1.3. TgŨŨŨɻəɧ Á´ ɖ Ůŭɛ

ɸɛ əgŨŨŨɻəɧ Ůɖ Ůŭɛ ŨəŸəgůɖɡɡŨɛg ůı ɛŨŨɛɡ ŮəɛŨəəŭəŮŨɻŬ ůɖɛŨəŨəɧ əŬɖɡɡŮɻɖůɛ Ũɤɜ ůgəŨɛəůɛɣəɤɜ əŮəŨɛɡɻɔı ɜ əŬə ŨəəɖɻəŮəŭɻŸŭŮɤɜ Ũɤɜ əgŨŨŸɻɤɜ ŮəɛŨəəŭəŮŨɻŬ ɛɻɖůɖɡ ɛŬ Ũɻɜ əŨŨəɧɖůɖ Ũɻɡ ű gůəəɔəɔɖŨɡəŬə Ũɻɡ´ ŬɖəɔəɔɖŨɡŨɛg Ũəɖɻı ´ ɜɛg ɛɻəŨəůɛɛi. ƉŨɛ Ůɖ Ůŭɛ

Ůəɻɷ ůŰŰůə ůŮ Ű ɻđŰ ɛɣɣɻđ: Ű) ůŰđɜ əgŰŰŰɻɷəɐ ɛŸɷŰ, ɓ) ůŰɷ gŰŰŰɻɷəŸ ůŰŰɻŮŸ. ȳ ůɷɜ ŰűɷɻŸ ůŰđɜ əgŰŰŰɻɷəɐ ɛŸɷŰ ɣɷŮə ſůŮŸəɘɻđ əŮəɘɻ ı ŭđ əgŰŰŰɻɷəɐ ɛŸɷŰ.

2.2.1.4. Á´ á Ůűɷ ĦůŰ ɜ

¢ əgŰŰŰɻɷəɐ ɛŸɷŰ, Ůɷ Ůəɤ əgŰŰŸɻɷɷ gɔɻɦ əŮəŰŰŮəɤ əgŰŰŰɻɷəŸ ůŰŰɻŮŸ Ůɷg əgŰŰŰɻɷəɷi Ůɘ´ yűɷg ɷɻɔŮəı ɜɷɜŰŰə ´ŰɻŮŰŰŭɻɤ əŮə ɛŮəůŰí ɜŰŰə ůŮŮá Ůűɷ ɜŰŰə ůgůŰđɛŸŰɤɜ. ÆŰđ ɛŮəɘɣŰđ Ůđɻgůı ůŰŰůđɻgůı ɛŮŰɷgŰɻŮəŭŮəɷɘ´ɷg ŮəűŮűɣɻɷgɜ. Ð əɘ´ ı ŭđɻgəůŰɦɻg (Ůɷ əɑ´ɷgəŮəɷɘg´ɷůŰđɻɷəŮɷəɣgŭɷɛɣgŰɷg), ɷ ɛgɷəɦɻgəůŰɦɻgəŮəɷ ɷůŰɑŰđɻgəůŰɦɻg (ŰŮɷůŮəŸəi ŰŰŰɻŮ əŮəđ đŰɛɣəɘŮŮəɤ əgŰŰŸɻəŮɷgůɑŮ) ɷɘ´ɷœɘůgɜɷəɘəŸŮ ɷŰŮəɷi ɜ ´Űɻɑɷg Ůɷ 75% Ůđɻgůgɜɷəɘəɐgđ ɛŸɷŮŰgůı ɛŮŰɷgđ.

2.2.1.5. Ðəɘəɦ Æı ɛŮ

ÆŰɷ ŮɑŮűɷ Ůɷg ɷəɘəɷi ůı ɛŮŰɷgđ, ɷ Ůɜđɻı ´ɘɜɷgđ ɷɻɔŮəɘůɛɦɻgđ ŭəŮɷɤɻɔœŰŰŰə ´əɣɷɜ Ŭɦ Ůɷggđ g´ɦəɷɘ´ɷggđŮəı Ű̃ɻɷggđɷɻɔŮəɘůɛɷi gđəɦɔɤ Ű̃ɤɜ ɘűəŮɑŰŰɻɤɜ ɷŰɻŮəŭŮɷəı ɜ Ůɷg. ¢ ŮəŸəgůđ Ůđɻgđ ůi ůŰŰůđɻgůı ɛŮŰɷgđ ůŮŮgŰɦ Ůɷ ŮɑŮűɷ ɷɻɔŮəɘůɛɷi ɷəɦɔɤ ůŰđɻgđůđ ŮəđɻɤɻɷɛɣŰđůđ ŮəŰɦ ůŰđ ɛɣŰɻđůđ ŮəđɻɤɻɷɛɣŰđůđ ůı ɛŮŰɷgđ, Ůɷ ɓŸɻɷgđ, Ůɷ i˛ɷgđ, ɷɘ ´ŰɻɘűɣɻŮəůđ, ɷəŭŰɻɛŮŰəɣgđ´ Ű̃gɷɣgđəŮə.

2.2.2. ¢ɷ ɛɷəŰɣəɷ Ű̃ɤɜ ŭi ɷ ŭəŮɛŰɻɘűɛŸŰɤɜ

¢ɷ ´ŮəŮəɦŰŰɻɷ əŮəɷ´əɣɷəɜ ŰűŰɻɛɷůɛɣɜɷ ɛɷɻəŮəɦ ɛɷəŰɣəɷ ŮəəŮəŮgŰɦ Ű̃ɤɜ ŭi ɷ ŭəŮɛŰɻɘűɛŸŰɤɜ, ůi ɛűɤɜŮ ɛŰŮɛ ɷ´ɷœ Ůɷ ůı ɛŮ ɷɤɻɔœŰŰŰə ůŰđɻ əɘ´ ı ŭđ ɛŸɷŰ (ş ʐ Æ), ´ɷg ´ŰɻɘəŮɛɓŸɜŮəɦəŮ ŰŰ əɘ´ɑŭəŮ Ůɷg ůı ɛŮŰɷgđ, əŮə ůŰđɜ Ÿəɘ´đ ɛŸɷŰ (ȷ ʐ Æ), đ ɷ´ɷđŮ ´ŰɻəɘəůəŮə ŰŰ g´ɦəɷɘ´ŮŸəɘ´Ů ůŰɷəɷŮəŮŰɷg Ůɜđɻı ´ɘɜɷg ɷɻɔŮəɘůɛɷi. ¢ɷ ɛɷəŰɣəɷ ŮgŰɦ ɓŮŰůœŰŰŰə ůŰđɜ ´ŰɻŮŰŭɷGɷ ɦŰəđɻȷ ʐ Æ ůŮ ŮəɷəɘəŮŸŰɷɛŮɣGəɷɛŮůɷGŰŰəɦŸůŰŰđŮɻɷ ůi ɜđŮđ əəɣŰŭəɷ´ɷɻəŮəɛ´ɷɻŮəɜŮɛŰŰɻđůđŮŸɜ ´ɻɷůŭɷɻəđŮəɣŮůgůŰŰŰəɦ Ű̃gůı ɛŮŰɷg´ɷg ɓɻɷœůəŰŰŰəɛɦɜɷ ůŮŮgŰɷɜ. ¢ ş ʐ Æ ´ɻɷəi´ŰŰəŮ ɦ Ű̃đ ŭəŮŭɷGɻŸ ɛŰŰŮəi Ű̃ɷg ůgɜɷəɘəɐgđ ůɣɛŮŰəɐgđ´ ɓŸɻɷggđəŮəŰđđɻ ȷ ʐ Æ.

2.2.3. ÐɷəgŭəůɛŰɻɷůɛŰŰəŸɛɷɻəŮəŸɛɷɜŰŰəŸŰəŰɛđůđɻgđůi ůŰŰůđɻgđůı ɛŮŰɷgđ

ũəŮɜŮŮəŮɷəůŰɷ´ɷəɻđɷi ɜɷ´Űɻɘɻɷəůɛɷɑ´ɷg ´ɻɷəi´Ű̃ɷgɜ Ů ɦ Ű̃ɷgđɻ´ɷđɣůŰɷgđ´ɷg ɔœɷɜŰŰəɔəŮŰđ ɛɣŰɻđůđ Ű̃đɻgđůi ůŰŰůđɻgđůı ɛŮŰɷgđɛŮɓŸůđ Ű̃ɷ ɛɷɜŰɣəɷ Ű̃ɤɜ ŭgɷ ŭəŮɛŰɻɘűɛŸŰɤɜ, đ ŮəŸəgůđ ɛ´ɻɷůı ɜŮ ɔœɷŮəůŰ ůŮ´ɷəgŭəŮɛŰɻɘűɛŸŰɤɜŮ. ÆŰɷ ɛɷɜŰɣəɷ Ű̃ɤɜ Ű̃ɻɷ ɜ ŭəŮɛŰɻɘűɛŸŰɤɜ, đ ůgɜɷəɘəɐ ůɣɛŮŰəɐgđ ŮəűŮəɻɷ´ɷɻŮəɛ´ɷɻŮəɜŮɛŰŰɻđůđŮŸɜ, ůŮŸəɘ´đ ɜđɻɣɐ ɛŸɷŰəŮůŰɷəɦɜŰɻɦůđ ůı ɛŮŰɷgđ. Ðůɻ ŮəűŰɣɻɤɜ ŭəŮɷɤɻɔœŰŰŰə ůŰɷ ɛɷɜŰɣəɷ Ű̃ɤɜ ŰŰůɣɻɤɜ ŭəŮɛŰɻɘűɛŸŰɤɜ ɦ´ɷg đ Ÿəɘ´đ ɜđɻɣɐ ɛŸɷŰŭəŮɷɤɻɔœŰŰŰəůŰɛɣŰŰəɘŮəŮ´ɻɤ ŰŰůɜŰɻđ.

2.3. ¢ ŮɷɜɘəɣgđɛɣŰɻđůđɻgđůi ůŰŰůđɻgđůı ɛŮŰɷgđgɣđəɐgđŮɜŸəgůđɻgđ

ȷ ɜŰűɷɻɷəŸ, ɷɘɛɣđɷŭɷɘŮɜŸəgůđɻgđůi ůŰŰůđɻgđůı ɛŮŰɷgđŮəɷŮəɘɻəɦəɷgđůđ:

2.3.3. Bioelectrical Impedance Analysis (BIA)

2.3.4. Dual-energy X-ray absorptiometry (DXA)

2.3.5. Skinfold thickness

2.3.6. Circumferences

2.3.7. Ultrasound

2.3.8. Near-infrared interactance (NIR)

2.3.9. Underwater weighing

2.3.10. Plethysmography

2.4. Assessment of Overweight and Obesity

The assessment of overweight and obesity is based on the evaluation of the history of excessive weight gain, the current body weight status, and the distribution of body fat. The evaluation includes 1) assessment of the degree of excessive weight, 2) assessment of the distribution of excess body fat, and 3) identification of associated risk factors and medical conditions. The presence of obesity-related complications (comorbidities) is also evaluated.

2.4.1. Body Mass Index

The body mass index (BMI), or Quetelet index, is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m^2). The World Health Organization (WHO) definitions of overweight and obesity are based on BMI. The BMI may provide a reasonable measure of body fatness in most adults and it reflects the risk of certain diseases related to excessive weight. However, BMI should be considered as a guide because it may not correspond to the same degree of fatness in different individuals. The health risks associated with increasing BMI are continuous, beginning at relatively low levels of BMI. For this reason, the WHO recommends that additional measurements be used to assess overweight and obesity and its associated risks. Table 2.1 shows the WHO classification of overweight and obesity according to BMI values.

Table 2.1: Classification of Overweight and Obesity According to BMI

BMI (kg/m^2)	Classification
<18.5	Underweight
18.5 – 24.9	Normal range
25 - 29.9	Overweight
30 – 34.9	Obese class I
35 – 39.9	Obese class II
≥40	Obese class III

ůđ ůcyůd ɛŮŮŭ›i Ůŭg qpz Æ əŭ› Ůŭg ´ɛůcůŮŭ›i ůx ɛŮŮ‰›ɛi ›Ŭ ŋ Ůŭ› ű›i›ɔɛ, Ůđ‡› đɔ›ə›dŬ›əŭ› Ůđ‡› ŮđƒɜəŋŋŮđ[ŮŮ. Ō Ůű›ɛ, Ů Ů‰ůɛ ɛŮŮ›yůŭ› Ŭ ŋ ɛŋɜɛɑƒ Ůŭg Ÿɛůđ ɛyŮ´důd Ůđɑƒ ůi›ůŮŮůdɑƒ ůx ɛŮŮ‰›ɛi ›ɔ́ɛggɑƒ, ůgůŮ›ɜŮŮŭ› ɜŬ ůgɜɛüŭ›ŮŮŭ› Ŭ ŋ ɛŮŮ´ɛůŭ‰ƒ Ůđɑƒ ´Ů´ɜű´yŋŭ‰Ůɑƒ ɛyůdɑƒ əŭ› üŮ´ɛŮŮ‰ı ɜ ´Ůŋɑı ɜ.[6]

2.4.2. qpŮ´ɛŮŮ‰›yɑƒ Ÿ Ůŋɑ›yɑƒ

¢ ɛyŮ´důd Ů›ɜ üŮ´ɛŮŮ‰ı ɜ ´Ůŋɑı ɜ Ů‰Ů‰ɛŸ Ůđɜ ´ɛůŋŮđ[ŮŮ Ůŭg g´ɛüŋŋ´ɜŋg ›ɔ́ɛggɑƒůŭ› ůı ɛŮ. Ƀ›ɔ ƀŮůɜ›yɑƒ´ŋɛŋ´ɛd›yůŭ‰ƒ Ůđɑƒɛ Ůđŋüɛg Ůœ›ŭŋŋŭ) Ů› ´Ÿɑɛɑƒ Ůŭg ›ɔ́ı üɛggɑƒ›ůŭ›i ůŮ›ɔŸɛɔɜ ůdɛŮœ Ů›Ů‰›ŭŮ›´Ů´ɑœůŋ Ů› ɛ›‰ŋ ´Ÿɑɛɑƒ›ɔŭ› ƀ) ɛɔ´Ů´ɜɛɑyɑƒ´ɛg ɛŮ´ɜɛi ɜŮŮ› Ů›Ů‰›ŭŮ›´Ů´ɑœɛgɜ Ů› ɛyůɛ ´Ÿɑɛɑƒ Ůŭg ɛ›‰ŋi g´ɛüŋŋ´ɜŋg ›ɔ́ɛggɑƒ. ¢ ɛyŮ´důd üŮ´ɛŮŮ‰ı ɜ ´Ůŋɑı ɜ ůŮ´Ů´Ů´Ÿɜx Ůŭg Ůŋŋƒɑƒ ůdɛŮœŭŮ ŭüœŭůŋyɜŭ´ɜɛ Ů›Ů‰ŭ´ɜ›yŭ´ůŋŮ‰›ŋ ůŮœɛŭ›ɔŭŮđɜ ´ɛůŋŮđ[ŮŮ Ůŭg g´ɛüŋŋ´ɜŋg ůx ɛŮŮ‰›ɛi ›ɔ́ɛggɑƒŭ› ŋ Ůđ ɛyŮ´důd ɛ›Ůɑƒ ɛŋɜɛ üŮ´ɛŮŮ‰›ɛɑ´Ůŋɑɛɑƒ. Ƀ›ɔ´ɜɛ ůgɜ›ɛdŮ‰ɑƒüŮ´ɛŮŮ‰›yɑƒ´Ůŋɑyɑƒ´ɛg ɛŮŮ´ɜŮŮ›ŭŮ›ɔ›ŭ›ɔdüŮ´ɛŮŮ‰›ɛ´Ůŋɑɛ Ů´ɜ›ŭŮ´Ÿ›ɔɛg, ü›ɔŭŮ´Ÿ›ɔɛg, dg´ɛ-x ɛɛ´›ŭŮ‰Ůdŭ, dg´Ů´›ŭŭŋɜ›ɔŭ, d›ɔɛɜ›ɔŭ›ɔ›ɛ, dɛdŋ›ŭdŭ›əŭ›ɔdɔŭůŮ´ɜɑ›ɛɜ›ɔŭdŭ. z ŮŮđ ɑŋ›ɛůd›əŭŮŸ›ɔ›dɔx ɜ Ů›ɔ›ůı ůŮx ɜ ɛɔ›ɛŮŮ´ɛůŭ‰ƒ Ůŭgŭ‰ɑƒɛŮŮŭ´ŋŸɑɛɜ‰Ůŭ› ůŮ´ɛůŭůŋ ş z Æ. ¢ ɛyd›ŭɛɑƒ Ůŭg Ů›ɛ Ůœ›ŭŭ› Ů ŋ Ů‰ɑƒ´ɜɛ ůgɑɜŸ ɑŋdůɔɛɛ´ɛ›dɛyɜŮŋƒɛ›ŭƒ›əŭ› Ůœ›ŭŭ›ɔɑ›ɛɑŋd, ɛɔ›ɛɜɛɛɔ›ɛ, ü›Ů› ´ŋɛ›əŭ› Ůœ›ŭŭ›ɔ´ŋɜɛ›əŭ› ɛ›‰ŋ´ɛ›ɔ›ɛŮ´ɜɛ›ɔ›ɛ Ů› ɛ´›ɔ›ůɛŋƒɑƒ´ɛg Ů Ů›ŭŮ‰Ůŭ› Ůœ›ŭŭ›ű›ɑŋdŮŋƒɑƒ. qůŮŋůɛ, ůdɛŮ›Ů‰›ɔŸɛŮ‰ɜ›ŭŮ›ɛŮŮŸ Ůđɑƒ Ůœ›ŭŭ›ŋŭ›ɔŭŮ‰ɛŮŮ›ůŮŮŋ›əŭŮŋ ´Ůŋ Ůü›ɛɑyɑƒ›əŭ› ŋŭ›ɔ Ů› Ů‰›ɜ Ů› Ů Ů‰›ɔ›ɛ ɛŮŮŸ›ɔůı ɛŮ›ŭŸ Ů‰ɑƒ ɛŮŮ›ŭŸ›ɔ›ɛ ƀŮŭɛŋ Ů ŋ Ů‰ɜ Ůɛ´ůŋɑdŮ Ů‰ɑƒ ŭŸůŭ‰›ɔŮ‰ŮŮůŭɛ.[6]

2.4.3. Ÿ Ůŋ´ɜű´yŋŭ‰ŮŭŮ´ɛyůdɑƒ

¢ ɛyŮ´důd Ů‰ɑƒ´Ů´ɜű´yŋŭ‰ŮŭŮ´ɛyůdɑƒ Ůœ›ŭŭ›ɔyɜŮŭƒ´ɛ›i ›əŭ›ŋɑƒ üŮœ›ŭ‰ɑƒ Ů›ɜ Ů´ɛdđ›ɜ ů´›əŭŭ›ɜ›ɔ›ɛi ›ɔ́ɛggɑƒ. ŋ´ŋ ɛŮ›ɔyŮŮɑƒyɛŭ›ɔűŭŭ›ŮŮŋŭ›ɔđ´Ů´ɜű´yŋŭ‰ŮŭŮ´ɛyůdɑƒůgůɛŭŮŮɛŮŮŭ›ɔůɛggŋŸɛŮŮŭŮ´ɛŮŮ›ŭŮ‰Ůɑƒ ɛŭ›ɜdŮ‰›ɔɛɑƒ›əŭ› Ů‰ɑƒ Ů‰ŭ›ɔ›ɛ ɛŮŮ›ŭŸ›ɔ›ɛ›əŭ› Ůɛɛɔ›ŋŭ›ɔ›ɛ ɛŮŮ›ŭŸ›ɔ›ɛ›ɔŭ› ŋŭ›ɔ Ů› Ů‰ɑƒ´ɛ ›əŭŮŮ›ɜɛɛ›ɔ›ɛ Ůɛɛɔ›ŋŭ›ɔ›ɛ›əŭ› Ů´ɛŮŮ›ɜ›ɔ›ɛ ŋŭ›ɔ Ů› Ů‰ɑƒ´ɛ ›əŭŮŮ›ɜɛɛ›ɔ›ɛ ɛŮŮ›ŭŸ›ɔ›ɛ ůx ɛŮŮ‰›ɛi ›ɔ́ɛggɑƒ. ¢ ɛyŮ´důd Ůŋŭ› Ů‰ɜ Ů›ɔ›ŭüŭ›ŭŮŮŋŭ› ůdɛŮ›Ů‰›ɔ›ɛ ›əŭŮı ɑƒdůɔ›ɛ Ů‰ŭ›ɔ›ɛ›əŭ› ´Ů´ɜgůŋŭ›ɔdŮ, ŭdɔ›ŭŭ›ɛ d ůgůůı ŋŮgůd Ů›ŭ›ɛɔɛ›ɔ›ɛi ›ɔ́ɛggɑƒ, ůɑŮŮɑŮŮŭ› ɛŮ Ůŋɜdɛyɜɛ ɔɛœŭgɜɛ ɜ›ůɛgɔ›ɛɜŭ›Ůůŭŭdɑƒ, g´Ů›ɔ›ɜű´yŋŭ‰ɛdŮɑƒ, ɔŮŋŭ›ɜŭ›ɔ›ŭ‰ŭ› ɜ ɜɛůdɛŸŭŸɜ ɔŭ›ŭ›ŭ‰ɛ Ůđ´ɛg Ħ. Æ Ůɛɜ ´œŭ›Ů 2.2 ű Ůœɛɜ Ůŭ› ŋƒɜ›Ů Ů›ɜ Ůɛı ɜ ´Ů›ű´yŋŭ‰Ůɑƒ ɛyůdɑƒ, ŮŮ ɛ´ɛdŮ ůi›ɛű›ɜŮ ɛŮŮɛ ŦBJ, ɛŮŋŮŋɑ›i ɜ Ůŋɜdɛyɜɛ ɔɛœŭgɜɛ ɔ›Ů Ůɛű›Ÿɜ›ůdɛ ɛŮŮŭ›ɛɔ›ɔı ɜ ŭ›ŮŮŋŭ›ɔı ɜ ´ɛg ůɑŮŮɑɛɜŮŭ› ɛŮŮđ[ɜ ´Ůŋɑůŋŭ›ɔdŮ.

[illegible] 2, [illegible]

[illegible]	[illegible]	
	[illegible]	[illegible]
[illegible]	≥94cm	**≥102cm**
[illegible]	≥80cm	**≥88cm**

2.5. [illegible]

2.5.1. [illegible]

[illegible] 70% [illegible] 60% [illegible] 6 [illegible] 12% [illegible] 23% [illegible] 40% [illegible] 2-3% [illegible][114]

2.5.2. [illegible]

[illegible]

[illegible] (9-12%) [illegible].[115]

[illegible]

[illegible] 2-3kg. [illegible].[6,115]

2.5.4. [illegible]

[illegible].[116]

2.5.5. [illegible]

[illegible].[117]

2.6. [illegible]

[illegible].[118] [illegible]

ة الأمر ، وقد ارتفعت نسبة الضريبة على القيمة المضافة من 25% إلى 21%.[119] وتجدر الإشارة إلى أن الحكومة الإسبانية قد أعلنت عن خطة لخفض العجز العام بمقدار 15 مليار يورو، وذلك من خلال زيادة الضرائب وخفض الإنفاق العام. وقد أثارت هذه الخطة ردود فعل متباينة، حيث رأى البعض أنها ضرورية لتحقيق الاستقرار المالي، بينما اعتبرها آخرون غير كافية لمعالجة المشكلة. وقد أعلنت الحكومة أيضاً عن خطة لخفض الإنفاق العام بمقدار 30 مليار يورو، وذلك من خلال خفض الرواتب والمعاشات التقاعدية وتجميد التوظيف في القطاع العام. وقد أثارت هذه الخطة أيضاً ردود فعل متباينة، حيث رأى البعض أنها ضرورية لتحقيق الاستقرار المالي، بينما اعتبرها آخرون غير كافية لمعالجة المشكلة.[120]

Ůđȝ sвůɛgəɷɑđ ŮgɜdŮвəђgf ´ŮɟYɔɛɜŮŮgf-1 (Insulin-like

Ůđgfsвůɛgəɷɑđgf

¢ sвůɛgəɷɑđ ŮвɷŮəɛdŮ´ɟɤŮŮpəɷɛ ɛɟɛђɜđ, Ůđgfɛ´ɛdŮgfŮɛ ɛђɟɤsɷ ŮɛŮŮвɷŮвŮŮəŮ ђ ŭi+ɛ´ŮŮŭвəɣgf Ůəgůɑŭůgf (J əŮə ɑb Ůəgůɑŭůgf). Bəɵ Ůəgůɑŭůgf ŮgŮɣgf ůgɜŭɣɛɜŮŮə ɛŮŮŮə+ Ůɛggf ɛɣůɤ ŭi+ɛ ŭəůɛgəɷűəŭəɪ ɜ ŭŮůɛɪ ɜ. ¢ ´ɟђŭɟɛɛd ɛɛɟűɛ Ůđgfsвůɛgəɷɑđgf, d´ɟɛ´ɟɛɯpůɛgəɷɑđ (z ɑb: 11.500), ůgɜŮɑdŮŮŮə ůŮŮɟsbɛůɪ ɛŮŮŮəŮə, ůŮđ ůgɜɣɛůəŭŮ, ůəůɣɟɛŮŮŮə ůŮɛ Ůəŭɛ´əŮůɛŮŮəђ ŭœŮgɛ Ŭɤɜ b-əgŮŮŸɟɤɜ. Æəůɑ gűɑůŮŮŮŮə Ÿɛůđ´ɟɤŮŮɛəgŮəɵɛ ŭəŸŭ´Ůůđ ŮђŮŮ ɛəɟɛůɤɛəɵŸɜɛgɛŮ, ɛŮŮŮɛŮ´ɛŮgŮəɵɛůɪɛŮŮđɜ´ŮɟŮɔɤɔɛ Ůđgf´ɟɛɯpůɛgəɷɑđgf(z ɑb: 9.000). ¢ ´ɟɛɯpůɛgəɷɑđ ŮɛŮŮə+ůŮŮŮəŮђ Ůəgf ɟ əŮəɑbŮəgůɑŭůgf, ´ɛg ůgɜŭɣɛɜŮŮə ɛŮŮŮə+ Ůɛggf ɛɣůɤ Ůɛg C´ŮŮəŭœg. z ŮŮŸŮɛ ůɑdɛŮŮəůɛђ Ůđgf, d´ɟɛɯpůɛgəɷɑđ ɛŮŮŮűɣɟŮŮŮəůŮđ ůgůəůgɵe Golgi ђ´ɛg ŮɛdđəůŮŮŮəůŮůəəɟɣŮəɵŸəɛəədŮ. Æəůɑ gűɑůŮŮŮŮə ´ɟɤŮŮɛəgŮəɵɛ ŭəŸŭ´Ůůđ ůŮ ŭi+ɛ ůđɛůəŮ Ůɛg ɛɛɟɑɛg Ůđgf, ɛŮ ŮɛŮɣəůɛŮ Ůɛ ůɑdɛŮŮəůɛђ Ůđgfsвůɛgəɷɑđgf(z ɑb: 5.808) əɵ Ůəђgf bəəəɔəŸŮəůəŮɔɛi Ůɛɛ ɛŮŮɛgf, Ůɛg ´ŮŮəŭœg C. ÕŮůə, d yəəɟsůd Ůđgf sвůɛgəɷɑđgf ůgɜɛŭŮůŮŮŮə ŮђŮđɜ Ůůəůgdɣgɤůd ɑůɛg Ůɟəɾdɛɛi ɛɛɟɑɤɜ´ŮŮəŭœg C əŮə đəŮɛəɟsůd ´ɛůɛŮɛůɤɜ´ɟɛɯpůɛgəɷɑđgf, ´ɛg ŭůəɣɛɛgɜ ŭəŮů´ŮůdŮů

Bɵ ɛɟђɜɛgf đɛəɛɤɤɛgf Ůđgfsвůɛgəɷɑđgf ůŮđɜ əgəəɛűɛɟɑŮůəŮə ђəgəf 3-5 əŮŮŸ, Ůəɪ ɛ əŮŮŮbɛəəůɛђgf Ůđgfɔɷ ŮŮŮə ůŮɛ ɛ´ŮɟəŮəůŮɛggfɜŮűɟɛi+g. ¢ sвůɛgəɷɑđ, ɛŮŮŸŮđɜ yəəɟsůɛ Ůđgf Ůђ Ůɛ ´Ÿɔəɟ ŮŮgf, űđŸɜŮəɛɣůɤ Ůđgf´gəŮdŮgfűəɣbŮgfůŮɛ ɛ´ŮɟŸ. TŮŮŸŮđɜ ´ɟɪ Ůđ ŭœŭɛ Ůđgfsвůɛgəɷɑđgf Ůђ Ůɛ ɛ´ŮɟŸ, əŮŮŮbɛəɷɑŮŮŮə ´Ůɟđ ɛg Ůɛ 50% ŮgŮɛgf. J ɜŮɑdŮŮŮ, ɛ əŮŮŮbɛəəůɛђgf Ůɛg ´ŮŮəŭœg C əŮə Ůđgf ´ɟɛɯpůɛgəɷɑđgf ɔɷŮŮŮə ɛђɜɛ Ůђ Ůɛggf ɜŮűɟɛi+g. ÕŮůə, Ůɛ ´ŮŮəŭəɛ C əŮə d ´ɟɛɯpůɛgəɷɑđ yɛɛgɜ ɛɟђɜɛ đɛəɛɤɤɛgf Ůɟůəgfyɤgf ŮɣůůɟəgfűɛɟygfɛŮɔŮə+ŮŮɟɛ Ůђ ŮgŮђɜ Ůđgfsвůɛgəɷɑđgf.[7]

3.2. Λi+đɛəůd Ůđgfyəəɟsůdgf Ůđgfsвůɛgəɷɑđgf

¢ɛɛ əgɟəђŮŮɟɛ Ůɟyđəůɛ Ů ɔəŮ Ůđɜ Ůђ Ůəůgdɣgɤůd Ůđgf sвůɛgəɷɑđgf ŮəŭŮə d ɔəgəђɛđ. ¢ ɔəgəђɛđ Ůəůɣɟɛ ŮŮŮə ůŮŮb-əi+ŮŮŮɟŮɛyůɤ Ůɛg ɛŮŮŮűɛɟɣŮŮđgf ɔəgəђɛđgf (glucose transporter, GLUT 2). Bɵ ɛŮŮŮűɛɟɣŮgf ŮgŮђgfɣɛŮəɛŮɛđəɛ ůgɔɔɣɜŮəŮɛŮŮđ ɔəgəђɛđ, ɛŮŮ ɛŮŮɣəůɛŮd Ůəŭ ђəɟsůd Ŭɤɜ b-əgŮŮŸɟɤɜ ůŮđɜ ´ɟђůəđɣd ɔəgəђɛđgf ɜŮ ɔœŮŮŮə bŮdɛəŮŮ. ȳŮŮə d ɔəgəђɛđ Ůəůɣəđůə ůŮŮ b-əi+ŮŮŮɟŮ, ŭəůəůgůə Ůđɜ ɣəəɟsůd Ůđgf sвůɛgəɷɑđgf. ūŮœŮŮŮə ђŮə d ɣəəɟsůd Ůđgf sвůɛgəɷɑđgf ŭəůəůgŮŮŮəŮђ ´ɟɛɯђɜŮŮɛŮŮŮbɛəəůɛəi+ ŮđgfɔəgəђɛđgfəŮəђɛəŮђ Ůđɜ ɑŭəŮŮđ ɔəgəђɛđ.

ɟ ɜ əŮəd ɔəgəђɛđ ŮвɷŮəɛ ´sɛ sůɛggɟђgf ŭəůəůɟŮəђgf´ŮɟŸɔɛɜŮŮgf ɔəŮŮđɜ ɣəəɟsůd Ůđgf sвůɛgəɷɑđgf, Ÿəəɛə´ŮɟŸɔɛɜŮŮgf, ђ´ɤgf ŮŮ Ůɛsɛɜɛ¥Ů´ɛg ´ɟɛůəŮɛbŸɜɛɜŮŮə ɛŮŮđɜ ůɟɛűɛ ɐ d ŭəɣəůɟůd Ůɛg ´ɜůgɛɛɜɛɔŮůůɟəɛi+ ɜŮɟɛg, ɛ´ɛɟɛi+ɜ Ůɑůdgf ɜŮ ´ɟɛəŮəɣůɛgɜ Ůđɜ Ůђ Ůəůgdɣgɤůɐ Ůđgf. ¢ ɣəəɟsůd sвůɛgəɷɑđgf ´ɛg ŭəůəůgŮŮŮə Ůђ Ůđ ɔəgəђɛđ, Ůəůɛi+ŮŮŮə Ůђ Ůđɜ ɣəəɟsůd ŭəŮűђɟɤɜ Ůəűŭɟəɛi+ ɜŮɟɛɛɜɪ ɜ, ђ´ɤgf ŮəůəŮɛ ŮəŸəɛɔɛ ɛŮŮđ ɔəgəŮɔђɜđ´ŮŮəŭœ-1 (glucagon-like peptide-

3.3. [illegible]

¢ ŭŋ·Ÿůd ŭłŋƒ sůɛgəœdŋƒ bŬůœůŬŬbůŭł ůi·3ŭůid ŭłŋƒ ɛŋ·ɛђ3dŋƒ ɛŮŭɛggƒg´ɛŭɛɢŮŋƒsůɛgəœdŋƒ, ´ɛg bŋ·ɑůəɛ3ŬŬbůŭł3 ŮŋƒŋŸ3ůŽŮ Ůŕ·3 əgŬŬŸŋ·ɣ·3-ůŭђG·3. Ō̃Ůů9 g´ɛŭɛɢŮŋƒsůɛgəœdŋƒ bŋ·ɑůəɛ3ŬŬbůŭɛ ɐ´Ůŋ·, ůŭɛggƒɛi·Ůŋƒ əŬbůŭɛ əɛ́ı ŭd ɑůŭђ, ŭdəŬŭɐ ůŭɛggƒ əəŬůəɛi·ƒsůɛgəɛɛŮŋŮůdd[ŭɛggƒɑůŭɛi·ƒ, ´ɛg ŮœŬb g´Ůi·dg3ɛɛ ɔɛŮ ŭł3 ɛɛɛɛђůŬŬůd Ůŕ·3 Ůŋ·Ůŋ·ɔůŽŮəı·3 ´ŋ·ı Ůŕ·3 gəı·3 ŭɛg ɛŋ·ɔŮb3ɑůɛɛi·. Á´ɛ́ŋ·ŋ·ђůdŮŬŬ, d sůɛgəœdŋƒ ŭŋ·ŮəŮbůŮɛd əəŬůəɛi·ƒɑůŭɛi·ƒ-ůŭђɛggƒ, ђ´·ɣƒ ŮœŬbd·ɣɛdɐəd, ŮůŬŮ ůg3ŭŮђɛŮ3d ɛŮg´ɛŭɛɢŮŋƒsůɛgəœdŋƒ, ŮůŬŮɛŮŭŽŮŬŬŋ·ɛi·ɛŮ3d ŮbŬůŋ·ŮŬd ɛŮŭ[illegible]ɛgg ŮbŮəђ3ɔɛg ɛŮŭł3 sůɛgəœdŋƒ ŭg3dŮŽəɛi· ´ŮŋƒŸɔɛ3ŬŬ-1 (IGF-1). ¢ ůi·3ŭůid ŭłŋƒ sůɛgəœdŋƒɛŮŭɛ3 g´ɛŭɛɢyŮ ŭłŋƒ Ůŋ·Ůŋ·ɔɛ´ɛŽůı ɛdŮ Ůŋ·ŋ·ɛůŽəəɐ əŽŸůd Ůɛg g´ɛŭɛɢyŮ, ɛŮ Ůŕ·ɛŮŋ·əůı·ɛŮ ŭł3 ŮŋƒŮɛůŕ·ůůɛŋ·gəœŕůɐ Ůɛg. ¢ ůi·3ŭůid ŭłŋƒ sůɛgəœdŋƒ ɛŮ Ůɛ3 g´ɛŭɛɢyŮ ŭłŋƒ ´gŋ·ɛŭŬŬůı ůŭɛ əi·ŬŬŋ·ɛ ɛəŮ Ůəgůɑŭ Ů ű·ůűɛŋ·gəəı ůŮŕ·3. ʐ ŮŭɛŽ Ůŋ·ђ´ɛ Ůŋƒђ ´ŋ·ɛəŮbɛi·3ŬŬb ɛŮŬŬbɛəŽŋƒ ůŭŽŋƒ ´ŋ·ŕ ŬŬ3ůŋƒ´ɛg ŮœŬbg´Ůi·dg3ŮŋƒɔŽŮł bŽəəɛɔŽəɐ ŭŋ·Ÿůd ŭłŋƒsůɛgəœdŋƒ.[7]

3.4. dbœəɛɔŽəəɣŋƒŭŋ·Ÿůůŋƒŭłŋƒsůɛgəœdŋƒ

¢ sůɛgəœd ´ŬœůbəůdɛŮbŭbəђ ŋ·ђəɐ ůŭł3 ɛɛɛђůŬŬůd Ůŕ·3 Ůŋ·Ůŋ·ɔůŽŮəı·3 ´ŋ·ı Ůŕ·3 gəı·3 ŭɛg ɛŋ·ɔŮb3ɑůɛɛi·. ¢ sůɛgəœd Ůŋɛ´ɛ´ɛůŽŮbŭɛ ɛŮŬŬbɛəŽůɛђ Ůŕ·3 Ůŋ·Ůŋ·ɔůŽŮəı·3 ´ŋ·ı Ůŕ·3 gəı·3 ɛɣůŕ· ŭłŋƒ ŭŋ·Ÿůdŋƒ ŭłŋƒ ůŮŋ·ůŋ·ůəgŋ·ɑŕŋƒ sůŭɛi·ƒ: ůŭɛ ɐ´Ůŋ·, ůŭɛggƒɛi·Ůŋƒ əŬbůŭɛ əɛ́ı ŭd ɑůŭђ. Ɛ́ŭɛggƒ sůŭɛi·ƒ Ůɑŭɛi·ƒd sůɛgəœdŋƒ ůgɛbŸəəŬbůŭł3 Ůɛdɐəůɑůd Ůŕ·3 Ůŋ·Ůŋ·ɔůŽŮəı·3 ´ŋ·ı Ůŕ·3 gəı·3 (Ůŋ·ŮbɛəŽůɛђɑŕŋƒ) Ůŋ·ı Ůŋ·ŮůŋŋŸəəŬbůŭł3 Ůɛ́ɛůђɛdůd əŬbůŭł3 Ůɛ́ Ůŋ·Ůɑůdŋŋ·ɣůd Ůɑŕůɛ ´ɛg ɣɛɛgɜ ɐŭd Ůŋ·Ůɛdɐəůɑŕůŭł (əŬŬbɛəŽůɛђɑŕŋƒ). ¢ ´əɐŋ·dƒ ɣəəŬbɣd sůɛgəœdŋƒ ɐ ŮɜŭdůŬŬ, d g´ɣŋ·ɛŮŋ·d Ůł·3důd ŭłŋƒ ŭŋ·ŮůŭłŋƒђŭłŕŽŕŋƒłŋƒ, ŭŮŋ· ůgɛbəbŸɛɜŬŬbɛŮůŭłɛɣ.

Ɛ́ŭɛ ɐ´Ůŋ·, d sůɛgəœdŋƒ ´ŋ·ɛŸɔůŋ·ŭł3 Ůŋ·Ůɛdɐəůɑůd Ůŕ·3 Ůŋ·Ůŋ·ɔůŽŮəı·3 ´ŋ·ı Ůŕ·3 gəı·3, Ůɑ3ŸŸ3ɛ3ŬŬƒ ŭłŋƒ ůi·3dŮůd əŬbůŭł3 Ůŋ·Ůɛdɐəůɑůd ɔəgəɛɔђ3ɛg. ʐ Ůŋ·ı3Ůŋ· ŭł3 ´Ůŋ·Ůɔŕɣɔɐ ɔəgəђŋƒɛdƒ, Ůŋ·ŮůŋŋŸəəɛ3ŬŬƒ ŭłŋƒ ɜŮɛɔəgəɛɔɣ3Ůůd (ůi·3dŮůd ɔəgəђŋƒɛdƒ) əŬbůŭł3 ɔəgəɛɔɛ3ђəgůd. Ɛ́gɔɑŋ·ђ3ŕɣƒ, Ůŋ·Ůŋ·ɔɛ´ɛůŽŮəı·3 ŭłŋƒ ɔəgəђŋƒəgůd (ɛŮŬŬbɛəŽůɛђɑŕŋƒŭłŋƒɔəgəђŋƒɛdƒůŮ´ ŋ·ŋ·ɛůŬŬŕŋ·gəəђŋ·ɛi·) əəɣŮůŋ·, ´ŋ·ɛŸɔůŋ· ŭɛ ůɑdɛŮŬŬůɛђ ´ŋ·ђůŋ·ɛɛɣ3 ɛgůŋ·ı3 ɔəŬ ŭłŋƒ ůi·3dŮůd əɛ́ Ůŋ·ı3 ɛ3ɣɣɣ3. Á´ɛ́ əɣɛ3, d sůɛgəœdŋƒ, Ůŕŕůŋ·ђŋƒ ŭəŮɔůŋ·ůŋ·ůɔ ŭłŋƒ əɛ́ ɛɔɣ3Ůůd ůŭɛ ɐ´Ůŋ·, Ůŋ·ɜŸ3ɛ3ŬŬƒ ŭłŋƒ ůi·3dŮůd Ůŕ·3 ´ɛəi· GŬɛdɔəɐƒ ´gəɜђŋƒłŬŬƒ əɛ́ɛ´ŋ·ɣŬŬůŋ·ı3 (VLDL) ´ɛg ɛŮŬŬŕɣŋ·ɛg3 ŬŬ Ůŕ·ɔəəgəŮŋ·ɑŕəŬ ůŭɛ əɛ́ı ŭd ɑůŭђ ɔəŬ ŮɜŭdůŬŬ əŬbůŭł3 Ůŕ·3 ůŭɛ ɛŮŭł3 ´Ůŋ·Ůɔŕɣɔɐ əŮŭɛ3ɔəı·3 ůŕ·ɛŸŕŕ·3 (əŮŭɛɔɣ3Ůůd).

¢ Ůůůɛŭɛgƒ ŭłŋƒ ɔəgəђŋƒdƒ ůŬŬ d´Ŭŭɛəi·ŬŬŕŋ·Ŭ ŭŮɜ ŮɜɣɔɑŕŬŬbŮŭł3 Ůŕ·ђ ŭłŋƒ sůɛgəœdŋƒ. ŋ·3ŬůdŮŬŬ, d sůɛgəœdŋƒ ŭɜŮɜůŋ·ůɜ ŭłŋƒ ´ŋ·ђůədŕɣd ɔəgəђŋƒdƒ Ůŕ·ђ ŭɛggƒɛi·Ůŋƒ əŬbůŭɛ əɛ́ı ŭd ɑůŭђ, ´ŋ·ɛəŮəı·3ŬŬƒ

ŝΎЗ ŮŬ Ű૪ з ǝgŰŰŶ ɤ з ŮЗђǵ, ŰgŬŭůdǵŰg ůŰǵз ЗŬůсgǝсǵ, ɔǝgǝђсǵ ´сg ´ɟсůǝŬƐбЎЗŰŰЗ Ŭ ђ ŰǵgǵƐɨŰǵ, Ŭ сŰŰǝŮ Ű Ŭ ђ Űǵз ЗŬůсgǝсǵ, ǝŬŰŰЗЎǝɤ ůdǵ ɔǝgǝђсǵǵ. ɆŰǵ gǵƐɨŰǵ, ǵ ЗŬůсgǝсǵ ´ɟсЎɔŮ Űǵз ŮЗŬ сdɐǝŰgůǵ Űǵǵ ɔǝgǝђсǵǵ, ŭǝŮŰɟ сзŰŰǵ Űǵ ůɨзǵŰůǵ ǝŬЗ ЗŬůŰɏǝǝсзŰŰǵ Űз ǝŬŰŰбсǝŝůƐђ Űg ɔǝgǝсɔђзсg ǝŬ Ů э ǝɏсз, ŭǝŮŰɟ Ů Űз ´ɟɤ ŰŭɓсůɨзǵŰůǵ.

ɆŰ ǝэ ɩ ŭǵ ŝŰђ, ǵ ЗŬůсgǝсǵ ´ɟсЎɔŮ Űǵз ŮЗŬ сdɐǝŰgůǵ Űg ǝɑ сgǵ ƐɏŮɤ Űǵǵ ŭǝɔŰɟ ůǵǵ Űǵǵ ǝэ с´ɟɤ ŰŭɓЗƐǵ ǝэ Ўůǵǵ. ɇс ɏзсgƐс ŬgŰђ gŭɟсǝɨ Ů ŰŬ ŰɟЗǝgǝŰɟ ɑŭŬ ´сg ƐŰŰŭɏɟсзŰŰЗ ƐŮŰǵ VLDL ǝŬЗ ƐŮЎǝŮǵ ´ǝсɨ ůŭǵ ůŬŰɟЗǝgǝŰɟ ɑŭŬ ǝэ с´ɟɤ ŰзŰǵ, ůŮǝэ Űɟ Ўсзɏ Ŭ. ɟ gŰЎ Ű ǝэ Űɟ Ў сзɏ Ŭ Ɛ´сɟсɨ з ůŰǵ ůgзɏсŮ Ŭ зŬ Ůŭɏǝdсgз ůŰ ǝэ сǝɨ ŰŰŰɟ Ŭ, ђ´сg ǝŬ ŮЗŬ сdǝŮ сзŰŰЗ ƐŮŰǵ ƐсɟŭƐ ŰɟЗǝgǝŰɟ ŭɑ з. ¢ ŮЗŬ сdɐǝŰgůǵ Űg ǝɑ сgǵ ´ɟсЎɔŮŰЗ Ů ɑdǵ Ŭ ђ Űǵз ŬgзdƐɏзǵ ´ɟђůǝdɣǵ ɔǝgǝђсǵǵ Ŭ ђ Ű ǝэ сǝɨ ŰŰɟ Ŭ, ǝђɔɤ Űǵǵ ŬgзdƐɏзǵǵ ɏǝŭɟ Ŭůdǵ Űg ƐŰŰŭсɟɏŬ GLUT 4 ůŰǵз Ů ŝΎЗ ŮЎ Űgǵ. Ɇgɔǝ Ůɟ ɶɏз Ŭ, ǵ Ŭɨзdůǵ Ű૪ з Ů э ɏŭɤ з Űǵǵ ɔǝgǝђсǵǵ ŮЗђǵ Ű૪ з ǝэ сǝgŰŰŶ ɤ з ɏсŮ ɤ ǵ Ŭ сŰɏǝŮƐŬ Űǵз Ŭɨ зdůǵ Ű૪ з Ů э ɏŭɤ з Űǵǵ Ŭ-ŭɤ ůŭсɟЗƐǵ ɔǝgǝŮ ђǝdǵ, ŮЗђǵ g´сůŰɟ ɩ ƐŬŰǵ Űǵǵ ŮŰŰɟ с´сdůǵǵ Ű૪ з ŮŮɨ dŰɟ ɤ з ǝэ Űɟ ɩ з сзɏɤ з ´ɟсǵ ŰɟЗǝgǝŰɟ ɑŭŬ. Ά´э ǝɏсз, ǵ ЗŬůсgǝсǵ ЗŬůŰɏǝǝŮ Űǵ ǝэ ђǝgůǵ, ´Űɟ ŮƐ´сŭсзŰŰǵ ɏŰŭ Űǵз Ŭ ŮŮgǵɏɟ ɤ ůǵ ǝэ Űɟ ɩ з сзɏɤ з, ´сg ǵŬ Ŭ сŰŮсɨ ůŬ ЗŭŬсƐɏзɤ ǵ g´ђůŰɟ ɤ Ɛ Ŭ ɔŬ Űǵ ůɨ зdŰůǵ ǝŰЗЗɩ з ůɤ ƐЎŰ૪ з Ŭ ђ ŰƐ ɐ´Űɟ. ¢ ´Űɟ Ŭ Ўзɤ ЗŬůŰǝɐ Űǵ ǝэ ђǝgůǵ Ů ŝŰɟ ɔсЎŮŰŰЗ ƐŮŰǵз ǝŬŰŰŭůŰǝɐ Űǵǵ сɟƐсзсŰgŬŭůdǵŰǵ ǝэ Ўůǵǵ, ŭǵǝŬŭɐ Űg ŮЗсɨ Ɛсg ´сg gŭɟсǝɨ Ů ŰŬ ŰɟЗǝgǝŰɟ ɑŭŬ ůŮ ŮŮɨ dŰɟ Ŭ ǝэ Űɟ Ў сзɏŬ. ӯ ǝŰǵ ƐŬсɑсэ´Űɟ Ŭ Ўзɤ Ů ŝŭɟ ЎŭŮǵ Űǵǵ ЗŬůсgǝсǵǵ ɏсgз ɤ ǵ Ŭ сŰɏǝŮƐŬ Űǵз ŬgзdƐɏзǵ ŮЗŬ сdɐǝŰgůǵ ǝɑ сgǵ.[7]

3.5. ɇс ůɨ ůŰǵƐŬ Ű૪ з ЗŬůсgǝЗс-ƐɶǵŰЗɩ з Ŭgзǵ ŰЗɩ з ´Űɟ ŬɔђзŰ૪ з (IGF System).

ɇс ůɨ ůŰǵƐŬ IGF ´ŬсŮǝɟɑůɶс ɟђǝс ůŰǵ ůǝŮŰŰЗɐ ЗЎ ŰgзŰ.[62]

3.5.1. Ƀэ ЗŬůсgǝЗс-ƐɶǵŰЗсɑŬgзǵŰЗсɑ´Űɟ ЎɔсзŰŰǵ (IGFs)

Ƀэ ЗŬůсgǝЗс-ƐɶǵŰЗсɑŬgзǵŰЗсɑ´Űɟ ЎɔсзŰŰǵ (IGFs) ůgзŰǵŮЗŰŰЗ ůŰgǵ сůŰŰбǝЎůŰŰǵ ǝŬЗ ŮЗŬЗ Ŭ ђ Űgǵ ´ɶ ůǵƐŬЗŰЗсɨ ǵ ɟgǵƐŝůŰɏǵ Űǵǵ ǝŮŰgɟɔǵŬǵ Ű૪ з сůŰЗɩ з ǝgŰŰŶ ɤ з ǝђɔɤ Űǵǵ ЗŬŰбсǝЗƐǵ Űgǵ Ů ɑŭɟ Ŭůǵǵ ůŰ ůǝŮŰŰђ.[34,35]

Ƀэ IGF-1 ǝŬЗ IGF-2 ŮЗŬЗ ´Ů ŰɑŬ ´Űɟ ɑсg 7,5 kDa ƐŮ67% ´ŰɟŝŰЗђŰǵŰŰ ůŮŬƐЗсзɏŬ.[27] ΆсŬЗ Ů ɑdǵ ŝůсgɟ ЎсƐђǝсɔŬƐŮŰǵз ЗŬůсgǝсǵ ђůсз ŬŭсɟЎ ůŰǵз ŬǝǝǵǝсgсŬ ǝŬЗ ůŰǵ ŭсƐɐ.[28] Ƀэ IGF-1, IGF-2 ǝŬЗǵ ЗŬůсgǝсǵ ´ŝŰɨ ŰŰЗђŰ ´ɟсɏɟ сзŰŰЗ Ŭ ђ ɏЗŬǝсЗђ ´ɟсɔсзЗђ ɔсзɑɶ. ǵ ůŰђůс, Ůɩ ǵ ЗŬůсgǝсǵ ŮЗŬЗ ´ɟɤ ŰŰɟсЗЎ ƐǵŬƐŰŰбсǝЗɐ сɟƐђзǵ, сэ IGF-1 ǝŬЗ IGF-2 ´ɟсЎɔсgз Űз ´сǝŬ ǝŬŭŬƐђ, Űǵз Ů ŝɑ ůǵ ǝŬɏ Űǵз ŭŬŬсɟс´сdůǵ Ű૪ з ´Űɟ ŝůђŰɟɤ з ǝgŰŰɟЗɩ з Űɨ ´ɤ з. ɆŬɟ ôђǝŬ ŬgŰЎ, сэ IGF-1 ǝŬЗ IGF-2 ŭŬŰǵɟсɨ з ЗŬůсgǝЗс-ƐɶǵŰЗɐ ƐŰŰбсǝЗɐ ŭɟŬůŰǵɟŝђŰǵŰŰ[29].

[36,37,38],

[24,25,26]

IGF-1 IGF-2 [51]

[52,53]

IGF-1 [27,28]

IGF-1

IGF-1 IGF-1

[54,55,56]

IGF-1

IGF-2 IGF-2

4 IGF-1

IGF

IGFs [63]

IGF-1

(osteoprogenitor proliferation),

[19,20,21,22,69,70]

[48]

28

[illegible] IGF [illegible] 50% [illegible] IGFs [illegible] (serum-free).[35] [illegible] IGF-1 [illegible] [illegible]

3.5.2. Oe g´eüecGüdf Ürz sseüegaessee-eseqÜeaız Ügzq[Üeaız ´ÜjÜehjzÜrz (IGF Receptors)

Bg´eüecyÜdfÜeg IGF-1 Üe[Üeüdeüeh Üfüiee Üzrzeyz[Üeüueüegaűüeaeigüüüeeigüeb üeeÜjeaÜe üeeseaYfjeeseqf eÜÜez g´eüecyÜÜfqf sseüegaeeqdqf.[26,28] ¢fjüee e IGF-1 fjüee aÜe e IGF-2 ´jeüüyzez3[Üeüeüez g´eüecyÜÜez IGF-1 eÜgyqdae ügccyz3üeÜ aÜe q sseüegaeeq üüüeeÜiÜ[Üeüe eÜ GÜeqafj[Üjq ügccyz3üeÜ. Be ´Üjeüüfj[Üjdfüf Üfj Üefqf Üzyyjcüeüdf Üez IGF-1 aÜe Üez IGF-2 üeÜeüeaÜbeiz3[Üeüe Üfj Ügüfjz Üez g´eüecyÜ. Bg´eüecyÜdfÜfqf IGF-2 /6-üra üüeeÜz3fjeqf (M6P) üeeÜe üeeseaYüguüeYejeÜeqf Üfj Üefggf g´eüecüdfÜeg IGF-1 aÜe Üfqf sseüegaeeqdqf.[58] Hjeüüyz3üeÜ Üez IGF-2 eÜgyqdae ügccyz3üeÜ, Üez IGF-1 eÜ´eai esejfj[Üjq ügccyz3üeÜ aÜe üÜz ´jeüüyz3üeÜ Üfqf sseüegaeeq.

Be IGFs Üaüdqf´jeüüyz3[Üeüez g´eüecyÜ Üfqf sseüegaeeqdqf, e e´eeqf üeÜeüeaÜbüeczÜ Üfqf Üdüüqzdeejeüeyzra Üfj Üefqf eüüüeaeseaygf Üeggf Üeüguüeyeüeqf.[27]

3.5.3. cpüeeÜieguüdf´jera[Üez3üdfÜra sseüegaessee-eseqÜeaız Ügzq[Üeaız ´ÜjÜehjzÜrz (IGF Binding Proteins, IGFBPs)

Be üjeYüüeqf Üra IGFs jgdeeeez3[Üeü Üfj edÜ eseczyz3üeÜ yzeü üeeseaY-ügccüeseaız üÜüeeÜjegüız ´jera[Üüpız (IGFBPs 1-6), ee e´edüf üÜüeeÜiegz Üegqf IGFs, Üeaeyfjce Üfqf sseüegaeeq, eÜgyqdae ügccyz3üeÜ.[59,60,61]

3.6. Ecyüdq sseüegaeeqdqfaÜe IGF-1

¢ sseüegaeeq aÜe e IGF-1 üeeÜe ügccüeseaY ejfjeÜ´eg üeüeeeqdqdaÜz Üfj y3Ü aeeseh ´jecez3seh ezez´Yüe Üe e´eee Üjcseaüeüdeh[Üez eÜ[Üfqf Üzü[eeqdq aÜe Üfqf Üze´eeqüdq Üra üqeYüüra ´eg ´jeyeg´[Üez Üfj üeÜdÜüeehfÜ[Üü Üjeú[eqf aÜe Ügzq[Üeaız ´ÜjÜehjzÜ. TÜüY Üfqf üeYjeüeüÜ Üfqf üeeÜeüeaÜbeiz3[Üeüez g´eüecyÜüeÜeraxjeüÜfqaÜüÜüiez3üeraxjeüüYejezeseaY üguüeezÜü ´eg üüÜ dqaÜüüeaY üeg´djüÜeiz üeÜüejüüeayf Üaeaüqaüseüag´üheüeüqf

[65,66] [67,68]

[illegible] ůÚĥəŬ ůɢŮŭĥɜ ŰŰ əi ŰŰŰɟŬ Ű€g Ŭɜdɟı ´ sɒɛg ůı ɛŬŰ€gf. Áɑɒ Ŭə ´ ɛəi ůdɛŬɜŰə ĥfgf ůŰ€ɜ ɛɟɔŬɜsůɛĥ ĥgɛə ɛĥɜɛ ɔəŬ Ű€l ůi ɜdŮůd Ű€lgf Ŭæɛůű Ŭɟɑɒdgf əŬə Ű ɣ ɜ əgŰ€ɛɟɣ ɛŸŰɣ ɜ Ŭəəŷ əŬə ɔəŬ Ű€l ɜ ´ɟ Ŭ ɔɛ ŬŰ€ ´ ɛɑdůd ´ ɛəəı ɜ ɛɜ Ůəŭ ɛŬɜŬ ɔı ɜ Ŭɜ Ű ŭɟŸůŰɣ ɜ. ¢ ɛəsəe ´ Ůɟ ůŰə Ű əĥ Ű€l ŰŰ Ű€g ůı ɛŬŰ€gf ůŮůɑŭdɟɛ əgɛŬɒŮŰŰə Ŭ ĥ 5-6 g. ɟ ´ ĥ Ŭg Ű Ÿ, ŰŰ 2,5g ´ Ůɟ ɑ ɛg ɓɟ ůəɛɜŰŰə ůŰl ɜ Ŭæɛůű Ŭɟɑɒd, Ű€ 1g ůŮəŸ ɛəŬ Ŭ ĥ Ű€gf ɛɛɟűɣgf Ŭ ɛɑɐəŮůdgf əŬə Ű€ g ´ ĥəɛɜ´ ɛ ůŰl ɛgɛůű Ŭɟɑɒd, əŬə ůŮŭŸűɛɟŬɣɜɛgɛŬ´ɛg ´ Ůɟ əɣɢɛgɜ ůɑŭdɟɛ, ĥ´ɣ gfəɑɢ. d əŰŰŰəŸůd.[7]

4.1.1. ɀ ɛɟűɣgf ůəŭɐɟɛg

Ł Ű€ɜ Ŭɜdɟı ´ sɒɛ ɛɟɔŬɜsůɛĥ əŬə ůŰŬ Ű ĥűæŬ, ɛ ůɑŭdɟɛgf Ŭ ŬɜŰŸŰŰə ůŮ 2 ɛɛɟűɣgf, Ű€ ŭəůdŮɜɐ (Ŭæɛəĥfgf ůɑŭdɟɛgf) əŬə Ű€ɜ Ű ɟ səůdŮɜɐ ůɑŭdɟɛ (ɛd Ŭæɛəĥfgf). Ŭ əɛ ůgɔəŮəɟ ɛɣɜŬ, ɛ ůɑŭdɟɛgf´ɛg ŮəŬə ůg ɜŭŮůŮɛɣɜɛgf ɛŮ Ű€l ɜ Ŭæd (´.ɢ. ůɑŭdɟɛgf əɟɣŰŰ€gf) ɛɜɛɛŸɢŮŰŰə Ŭæɛəĥfgf ůɑŭdɟɛgf əŬə ´ɟɛůəŬɛɓŸɜŮŰŰə Ŭ ĥ Ű€l ɜ əŰŰŰɜŸəɤůd ɛɤəı ɜ Ű ɟɛűı ɜ, əgɟɑɤgf ɔĥɔɤ Ű€lgf ´Ůɟ ŮɛĥɛŮɜdgf ´ɛůĥŰ€lŰŰgf Ŭæɛůű Ŭɟɑɒdgf əŬə ɛgɛůű Ŭɟɑɒdgf. ɟ ɜŰdŮŰŰ, ɛ ůɑŭdɟɛgf´ɛg ŭŮɜ ŮəŬə ůg ɜŭŮůŮɛɣɜɛgf ɛŮ Ű€l ɜ Ŭæd (´.ɢ. ůɑŭdɟɛgf ůŰŰűgŰəŸŰɟĥűæŬ) əɣɔŰŰŰəɛd Ŭæɛəĥfgf əŬə ´ɟɛůəŬɛɓŸɜŮŰŰə ůg ɜɔdɤgfɤgf űŮɟɟɣŮd, Ŭæɛůɜŭdɟɛd, ɐ Ÿəəd ɛɛɟűɐ. ¢ŮɛɤəŸŰɟĥűæŬ´Ůɟ əɣɢɛgɜ əŬə Ű€gf 2 ɛɛɟűɣgf (Ŭæɛəĥ əŬə ɛd Ŭæɛəĥ), Ůəı ŰŰűgŰəŸŰɟĥűæŬ´Ůɟ əɣɢɛgɜ ɛĥɜɛ ɛd Ŭæɛəĥ ůɑŭdɟɛ.[6]

4.1.2. Ŭ Ŭɟ Ÿɔɛ ɜŰŰgf´ɛg Ŭg ɜŸɜɛg ɜ Ű€l ɜ Ű ɛɟɟɟĥűdůd Ű€g ɛd Ŭæɛəɛi ůəŭɐɟɛg

- Ł ŸəɢŮɟŬ (´.ɢ. űɟɛgəŰĥɛd, ůɛɟɓəŰĥəd)
- Ŭ Ŭɟ Ÿɔɛ ɜŰŰgf əɟɣŰŰ€gf
- ɟ ɜŬɔɤɔəŸɛɜɣŬ (´.ɢ. ɓəŰŰɛɑd C, əəŰɟəĥɛɜi)

Ƀə ŭgɛ ´sɒ ɛŮəŸŰŰ€ɣɜɛə ŭəŬəŰ€lŰəɛɑ´ŮɟŸɔɛ ɜŰŰgf´ɛg ´ɟɛŸɔɛgɜ Ű€l ɜ Ű ɛɟɟɟĥűdůd Ű€g ůəŭɐɟɛg ŮəŬə ɛ ´ŮɟŸɔɛ ɜŰŰgf´ɛg ɓɟɑůəŰŰə ůŰ€ əɟɣŰŰgf, ůŰŰ´ɛgəŮɟəŸ əŬə ůŰŰ ɣŸɟŸgŬ (´ŮɟŸɔɛ ɜŰŰgf əɟɣŰŰ€gf) əŬəd ɓəŰŰɛɑd C. O ůɑŭdɟɛgf´ɛg ´ɟɛɣɟɢŰŰŰə Ű ĥ Ű€ əɟɣŰŰgf´ŬɑɛůəůdɛŬɜŰəĥɟɟəɛ ůŰl ɜ Ű ɛɟɟɟĥűdůd Ű€g ůəŭɐɟɛg ĥɛə ɛĥɜɛ ɔəŰŰı´ŮɟɣɢŮə Ŭæɛůű Ŭɟɑɒd (ůŰl ɜ ɛ´ɛdŬ ɛ ůɑŭdɟɛgf ŮəŬə ŭəůdŮɜɐ) ´ɛg Ű ɛɟɟɟɛűŸŰŰə´sɒ Ůəɛəɑ Ŭəɔəŭ Ű ɑŭɟɜŸɜŮəŬə Ű ɛɟɟɟĥűdůd Ű€g ůəŭɐɟɛg ɛŮ ɛdɢŬɜsůɛĥ ´ɛg ĥɛɤgf ŭŮɜ ŮəŬə ɔɜɤůŰĥgf. Ŭ ɑŭɜĥŰŰŰŰ d ´ɣɣd Ű ɜ ɑɤəı ɜ sůŰı ɜ ɛŭdɔŮı ůŮ ´Ůɟ Ŭɔɤɔe ´Ů Ű ŭɑɤ ɜ ´əɛi ůəɤ ɜ ůŮ əgůŰŰı ɜd, ´ɛg ůɢŰŰɑɛɜŰŰə ɛŮ Ŭg ɜdɛɣɜd Ŭ ɛɟɟɟĥűdůd ůəŭɐɟɛg.[112] Ō ɜŬgf Ÿəəɛgf´ sɑŬɜĥfgf ɛdɢŬɜsůɛĥfgf ɛŮ Ű€ɜ ɛ´ɛɑɐ d əŰŰŰɜŸəɤůd əɟɣŰŰ€gf ɛ´ɛɟɔŰı ɜŬ Ŭg ɜŸɜŮəŰl ɜ Ŭ ɛɟɟɟĥűdůd ɛd Ŭæɛəɛi ůəŭɐɟɛg ŮəŬə ɛɣůɤ Ű€lgf ŭəɣɔŮĵůdgf Ű€lgf ɔŬŮĵəɛgf ɣəəɟəůdgf. ȳ ůɛɜ ŬíɛɟŸůŰl ɓəŰŰɛɑd C, Ŭg ɜŸɜŮəɛŮůɛŮɜŮĵ ɛŮɜɛ Ůĵĥ´ɛ Ű€l ɜ Ŭ ɛɟɟɟĥűdůd Ű€g ůəŭɐɟɛg ɛŮŰŰŮĵɣ´ɛɜŰŰgf Ű€ɜ Ůĵəůd Ű€ɜe ůŮŭəůd Ű€ɜe ůɑŭdɟɛ (ŬɜŬɔɤɔəe ŭɟŸůd).[113]

4.1.3. Ŭ Ŭɟ Ÿɔɛ ɜŰŰgf´ɛg ŬɜŬůŮɣəəɛgɜ Ű€l ɜ Ŭ ɛɟɟɟĥűdůd Ű€g ɛd Ŭæɛəɛi ůəŭɐɟɛg

- ūgŰəhŋ ɛɜi (´ɛg ´Ůŋəɣ₲ŮŰŰɔ əgŋɑɤɠ ůŰŰ ŭdɛdŰŋəŬɔY ɛəɜəɛɠ Ŭɔɣůůɤɠ əŬɔ ůŮ əY´ɛəŬ əɤŰ₲Ŭɜəɔ¥, ɜdŋɛi-ɠ əŬŋ´ɛi-ɠ əŬɔ ů´ɦŋɛggɠ): ɛŮɑ ɜŮɔ ůdɛŰɜŰəɔY Ű₫ɜ Ű ɛŋŋɦűdůd Ű₫g ŰŋəůdŮɜɛi-ɠůəŭɛŋɛg (ɣɤɠəŬɔ50-80%).
- ƀɜŬɔɛɜəɔɦŋɛɜi (´ɛg g´¥ŋ₲Ůɔŕŋɛ.g. ůŰ₫ ŰůY₀əŬɔůŰ₫ ů´Ŭɜ¥ə₀).
- ŋ ɛdga-Ůɜɛŭə₀Ůɛɛɜɛ₲ŰŰŋŬɜɛɜəɦŋɛɜi (EDTA) (´ŋɦůdŮŰ₫ Ůŋɛűœɤɜ ɛŮŭŋ¥ůd ůŰŰdŮŋɛ´ɛəd₫ŕ).
- ūɤůɓəŰɑɜd (´ŋɤŰŰɜd Ű₫g əŋɦəɛg Ű₫g Ŭɔɔɛiŕ).[6]

4.1.4. ƀŮŋ¥ɔɛɜŰŰƒ´ɛg ŬɜŬůŮŷəəɛgɜ Ű₫ɜ Ű ɛŋŋɦűdůd Ű₫g Ŭɛɛəɛi əŬɔ Ű₫g ɛd Ŭɛɛəɛiŕ ůəŭɛŋɛg

- ʐ Ůəɤ ɛɣɜd´ŮŋŬɔɤɔɛ ɔŬůŮŋəɛi ɛɜɣɛgƒ.
- ŋ ůɓɣůŰɛ (ŰŰ ůgɛ´əd ŋɤ ɛŮŰŰ ŬůɓŮůŰ₫g Ŭəə¥ əŬɔ Ű₫ ŬůɓɣůŰɛ Ůɤɜ ɔŬɔŬɔŰ₫əɛɛəɤɜ ɜ ´ŋɛɦɜŰɤɜ Ůɛ´ɛŭœɛgɜ ůdɛŰɜŰəɔY Ű₫ɜ Ű ɛŋŋɦűdůd əŬɔ Ůɤɜ ŭi-ɛ ɛɛŋűɤ ɜ ůəŭɛŋɛg əŭɑɤɠ ɦŰŰɜ əŬŰŰɜŬəɤ ɜɛɜŰŰɔŰŰgŰɦɛŋɛɜŬɛŮɔŮɛŮ´ɛg ´Ůŋəɣ₲Ůɔůɑŭdŋɛ.[6]

4.1.5. ʐ ŮŰŰɓɛəɔůɛɦŋƒŰ₫g ůəŭɛŋɛg

¢ɛ ɛŮŰŰɓɛəɔůɛɦ Ű₫g ůəŭɛŋɛg ɛ´ɛŋɛi-ɛŮ ɜŬ Ű₫ɜ ŭəŬɣůɛgɛŮ ůŮ 4 ůŰŶŭəŬ: Ű ɛŋŋɦűdůd, ɛŮŰŰűɛŋ¥, ɛŋdůəɛɛ´ɛɑdůd əŬɔ Ű ɛdɛəŮgůd. ƀəɖɛŮŋɛůəƒŰ ɪ ɔŮəŮƒŰ₫g ůəŭɛŋɛg ŮɔɔŬɔ´Ůŋɑɛg 1mg Ű₫ɜ ɖɛɣŋŬ, ůŰ₫ƒɛ´ɛdŮƒ´ŋɣ´Ůɔ ɜŬ´ŋɛůŰŰdŮɑ0,5mg ůŰ₫ƒɔgɜŬɔɑŮƒ´ɛg ɓŋɑůəɛɜŰŰɔůŮɔɦɜɛɖ ´Ůŋœŭɛ. ƀəŰ ɪ ɔŮəŮƒŰgŮŋŰɣƒəŬɔi´Ű₫ɜŰŰɔ Ű ɦ Ű₫ ɔɛɣɤɖ Ůŋɛűɛƒ, ɖɛ´ɛdŬ´Ůŋəɣ₲ŮɔɛŮɔ 10-20mg ůəŭɛŋɛg, Ű ɦ ŰŰɛ´ɛdŬ Ű ɛŋŋɛűŸŰŰɔ Ű₫ 10% əŬɔ ŮɛɛɣɜɤƒəŬɔi´ŰŰŰŰɔ Ű₫ ŬɜŬɔəŬɑɛ ɖɛŮŋɛůəɛ ´ɛůɦ ůəŭɛŋɛg. ¢ Ű ɣəəŋɛůɖ Ű₫g ůəŭɛŋɛg ŮɔɔŬɔ´ɛəi ɛəŋɛ (1mg/24ɤŋɛ) əŬɔɔɑŰŰɔəɑŋɑɤƒŰ ɦ ŰŰəɦ´ŋŬɜŬ. ƀ ůɑŭdŋɛgƒŰ ɛŋŋɛűŸŰŰɔůŰ₫ ŭɤŭŮɔŬŭŸɔŮgəɛ əŬɔůŮɜ Ŭɜɪ ŰŮŋɖ ɛɛgŋŰŮƒɜɛůŮɔŭŬgƒ ůŮ ŭəůdŮɔɛ Ű₫g ɛŋŋűɛ. ƀ Ůŋəůd ŮɔɛɛɣɜɤƒəůŰ₫ ůɑŭdŋɛgƒ Ůɛɛɣɜɤƒ ůgɜɖɖəůɛɣɜɖɖƒŭəŬŮŋɛűɛg) ´ŋɣ´Ůɔ ɜŰŬɜŬɖůɔůŰŭəůdŮɔɛ. ¢ɛ ŮɜŰŮŋəɦ Ů ɑɛəɛɑ Ű₫ɛ ɛ´ɛɑɛ ŮɔɜŬůűŬəɑɛŮɔŮ₫ɜ Ű ɛŋŋɦűdůd Ű₫g ůəŭɛŋɛg űŬɑŮŰŰɔɦŮɔŋɖɛɑŮɔəŬɔ Ű₫ɛ ɓŬɖɛɦ Ű₫ƒ Ű ɛŋŋɦűdůəɛƒ Ű₫g, ŬɜŸəɛɔŬ ɛŮŰ₫ƒ ŬɜŸɔəŮƒ Ű₫g ɛŋɔŬɜəůɛɛi. ƀ ůɑŭdŋɛgƒ ŭəɣŋɣ₲ŰŰɔ ůŰ₫ ŮɜŰŮŋəɦ Ů ɑɛəɛɑ əŬɔ ´ŮŋŬəɜŰɛɓ¥ɜŰŰɔ Ű ɦ ɛəŬ «´ŋɤŰŰɜd- ɛŮŰŰűɛŋɣŬ», Ű₫ ůəŭdŋɛűəɑɑd (ɐ ŮŋŭůűŮŋɑɑd). ¢ ŮŋŭůűŮŋɑɑd ŮɑŭɔɛəŬəɑŭůəɑɐ «´ŋɤŰŰɜd-ɛŰŰŰűɛŋɣŬƒ» ɖɛ´ɛdŬɛŮŰŰűɣŋɔ Ű₫ ůɑŭdŋɛ ůŮŭəŸűɛŋŬɦŋɣɔŭɜŬɐ əůŰ₫ɜƒ, əgŋɑɤƒɦɛɤƒůŰ₫ ɛgŮəɦ Ű ɜ ɔůŰɜ ɦ´ɛg Gŋdůəɛɛ´ɛəŮŰŰɔ

ɛŬŰǻůɛђ ŬǣɛǝůűŬǿɑdɠ. ɇŬ Ǖǥdɟ Ÿ Ŭǣɛǝůűǔǿ ǝŬŰŸ Űɖɜ ǝ Ŭ ђ ŰŬ ǝɨŰŰǕɟŬ Űɞg ɸǝǝŰǥɞŬǚɞɖǝŬǝɨ Ɇgůǘɛ ŬŰɞɠ ɛŬǝɠ Ŭ ђ Űɖ ǚǝŸů ´Ŭůd Űɖɠ Ŭǣɛǝůűǔǿɑdɠ ůɑǚdɟɛɠ ǕɜŬ ɛɖɖǝŬɨ ŰŰŬǝůŰɞ ɸÆ ɛŮŰɖ ɛɛɟűɐ Űɖɠ űǕɟǝŰɞdɠ ǝŬɜŰɖɠ Ŭǣɛǝůǝǚdɟɑdɠ.[7]

4.2. ü Ǖɟǝ Űɞd

¢ űǕɟǝŰɞd ŮɞŬǝ ɛǝŬ ɔǝgǝɞ´ɟɤŰŰɜd ɛŮɛɛɟǝŬǝђ ɓŸɟɛɠ 440 kD ´Ǖɑɛg ǝŬǝ Ŭ ɞŰŰǝŮŰŰǝ Ŭ ђ ɏɜŬ ´ɟɤ ŰŰɞǝђ ǝɏǝgűɛɠ, Űɖɜ Ŭ ɞűǕɟǝŰɞd, ǝŬǝ ɏɜŬɜ ´gɟɐɜŬ ´ɛg ´Ǖɟ ɏɢŮǝ ´Ǖɑɛg 4000 ŸŰɞɛŬ ůǝǚɐɟɛg. Ʉɛǝǝ Ÿ ɛђɟǝŬ űǕɟǝŰɞdɠ Űűɛɨ Ŭ ɛɓŸǝǝɛgɜ ɏɜŬ ɛɏɟɛɠ Űɖɠ Ŭ ɞűǕɟǝŰɞdɠ Űɖɟɛɑɛɜ ŰŰǝ ɛŮŰɖ ɛɛɟűɐ Ŭɛђɟűɤɜ ůgɛ´ǝŮɛŸŰɜ, ´ɛg Ŭ ɞŰŰǝɛɨɜ Űɖɜ Ŭǣɛǝůǝǚdɟɑd, d ɞ´ɛdŬ ŮɞŬǝ ɛɟŰŰɐ ůŰɞ ɞ´Űǝђ ɛǝɟɛůǝђ´ǝ ɛŮŰɖ ɛɛɟűɐ ǝɛǝǝɑɜ. Ƀ ůɑǚdɟɛɠ ǕgŰђɠ´ɛg Ů ŬɜŬɛɟdůǝɛɞ´ɛǝŮǝŰŰǝɔǝŬ Űɖ ůɨɜdŮůd Ŭǣɛǝůűǔǿɑdɠ ǕɜŬůűŬǝɞŮǝ Űɠ ǝŬɖdɛǕǝɏɠ ŬɜŸɔǝŬɠ Űɖɠ Ŭǣɞ´ɛɖůdɠ (´Ǖɑɛg 25 mg), Ůɜɩ ɞ ůɑǚdɟɛɠ Űɤɜ Ǖɛűɩ ɜ ŬɜŰǝůŰŰɖɛɑŮɛђɜɛ ŰɠŬ ɩ ǝŮŬŰɠ.[7]

¢ ɓǝůɨɜdŮŰɐ Űɖɠ űǕɟǝŰɞdɠ ŮɏɔɛŮŰŰǝ Ŭ ђ ŰŬ Ů ɑ ŮŬ Űɞg ŮɞǚɛǝgŰŰŸɟǝɛg ůǝǚɐɟɛg ǝgɟɑɤ ɠ ɛɏůɤ Űɖɠɟgɖɛǝ ůŰǝɐɠ´ɟɤ ŰŰɜdɠɔǝŬ Űɞ ůɑǚdɟɛ (IRP). ¢ IRP ŮɞŬǝ ɛǝŬ´ɟɤ ŰŰɜd ´ɛg ǝŮǝŰɞgɟɔŮɑ ɤ ɠǚŮɐ ɛǕǥŰǝђ ɛђɟǝ ŬǝǝŸ ǝŬǝɤ ɠŬǝůdɖŰɐɟŬǥŰɤ ɜ ŮɞǚɛǝgŰŰŸɟǝɤ ɜ ůgɔǝŮɜǕɩ ůŮɤ ɜ ůǝǚɐɟɛg. ɀ Ů Űɖɜ ´Ű ůd Űɤ ɜ ŮɞǚɛǝgŰŰŸɟǝɤ ɜ ůgɔǝŮɜǕɩ ůŮɤ ɜ Űɞg ůǝǚɐɟɛg, d IRP ǚŮɞ Ůɜɩ ɜŮŰŰǝ ɛŮůɑǚdɟɛ ǝŬǝ ŬɜŬůǕɏǝǝŮŰŰǝ d ´ǕɟŬɜɤ ɔɐ űǕɟǝŰɞdɠ Ůɜɩ ůgɛɓŬɞŬǝ Űɞ ŬɜŰɖŮŰɞ ђŰŰɜ ɡ´ŸɟɢŮǝ ´ǕɑůŮɞŬ ŮɞǚɛǝgŰŰŸɟǝɤ ɜ Ŭ ɛdŮɛŸŰɤ ɜ ůǝǚɐɟɛg.[6]

¢ űǕɟǝŰɞd, ´ɛg ɛ´ɛɟŮɑɜŬŬɜǝɛɜǕgdŮɑůŰɞ ŬǝɛŬ, ŬɜŰŰɜŬǝǝŸ ŰɠŬ ɛdɐǝŮɠůǝǚɐɟɛg Űɞg ůɩ ɛŬŰɞɠ. Ʉɟɛǝůǚǝɟɑɛ ŰŰǝ ɛŮŬɜɛǝɞɛǝɔǝɐ ɛɏdɞǚɞ ǝŬǝ ɛǝűgůǝǝɛɔǝɏɠ ŰɞɛɏɠŰɖɠ ǝgɛŬɞɛɜŰŰǝ Ŭ ђ 30-330 ng/mL. Æ´ɑ ŮɑŬ űǕɟǝŰɞdɠ ǝŸŰɤ Ŭ ђ 15 ng/mL ɔǝŬŰɞgɠ Ůɜɐǝǝ Ůɠ ǝŬǝ ǝŸŰɤ Ŭ ђ 12 ng/mL ɔǝŬ ŰŬ ´ŬǝǚǝŸ dŮɤ ɟɛɨɜŰŰǝ ŮɞǚŮǝŰǝŸ ůǝǚdɟɞ´Ůɜǝɐɠ ŬɜŬɛdŬɠ. ¢ űǕɟǝŰɞd ɛɟɛɨ ɏɢŮǝ gɣdǝɐ ŮǝǚǝђŰɖŰŬ ɔǝŬ Űɖ ǚǝŸɔɜɤ ůd Űɖɠ ůǝǚdɟɞ´Ůɜǝɐɠ ŬɜŬɛdŬɠ, ǝɑɤ ɠ ђŰŰɜ ůgɜǚgŸɛŰŰǝ ɛŮ ŸǝǝŮɠ ´Ǖ ŬɛɏǕɛgɠ, ђ´ɤɠ Űɖɜ Űɞɛɐ Űɖɠ Ŭǣɛǝůűǔǿɑdɠ.[6] ɖ ůŰђůɞ ŮɞŬǝ ɛdŬ´ɟɤ ŰŰɜd ɛɜŮdŬɠűŸůdɠ ǝŬǝ ŸǕŬɛ´ɛɟŮɑɜŬ ŮɞŬǝ ɣǕǥǚɩ ɠŬɢɜdɛɏɜd ůŮǝŬŰŰŰůŰŸůǕɠ ɛɟђɜǝŬɠ űǝŮɛɛɜɐɠ, ɛɜŮɖŬɠ ǝɛɑɤ ɜdɠ, ůŮ ǝŬɞɛɐdd ɜɛůɐɛŬŰŰɐ ɛŰŸŬ ђ ´ɟђůǝdɣd ŬɖŬɜђǝdɠ.[128]

΄əŬɔ ůɨ ůŰŰůdʃ ůι ɛŬŰɛʃ ɛŮŰŰ Ůά ŮɪŬ sɓůɛgɔɷdʃ əŬɔ

ɛgůŬʃɓɔɓɔɜɔɟ.ŬɪάŬʃ.

5.1. ƐgůɕɣŰɓůdʃ ɛůŰɓɷɛʃ΄ gɔɜɦŰŮŰʃɛŮ

5.1.1. ŰŰŮά ŮɪŬ sɓůɛgɔɷdʃ. Ůŭɜ sɓůɛgɔɜɛŮgŬɓůdđůdŬəŬɔŮŭɜ sɓůɛgɔɜɛŬɔŮɪůŰŰůd.

Ɉ΄Ɣɟɕůɔ ŮŮɟəɛʃ ɓɔɓɔɜɔɔɟ.ŬɪάŬ΄ɛg ŬΌɛŭŮɓɔɜɨůɔ ɦŰɔd sɓůɛgɔɷdʃ, ŭɟɪ ɜŰŰʃ ůŬɜ ŬɔŬɔɛɔɷɔɦʃg ΄ŮɟƳɔɛɜŰŰʃ ůŰŰΌɛůŰƳ, ɣɕůɔŮŭɜ ɷɔŬɔɦŰŭŭŰɟɛůɔəŬɔɜŬŮgɜɛůɔŮŭɜ ɛůŰɓɛ ΄gəɜɦŰŭŭŰ əŬɔɷůɕɨ, ɛɣůɤ Ɣɛŭůɤɜ əŬɔ/ɛ ɣɛɛŭůɤɜ ŮɟɷŭɟƳůŰɤɜ ŬgŰɛʃůŰɛɜ ɛůŰɓɔɦ ůɕdɛŰŰɓůɛɦ.ʒ ŮɓƳůd ŭŭɜ ŬɔŬůəɦ΄důd ŰŰɤɜ Thrailkill K. et al.[76], d sɓůɛgɔɷdɛ΄ɛɟ.ůɒɜŬdŰɤɟ.dđůɒŬɔŬɔɛɔɷɔɦʃg΄ŮɟƳɔɛɜŰŰʃg ůŰɛɜ ɛůŰɓɔɦ ůɕdɛŰŰɓůɛɦ ɔɷŬŰɛggΓŮɟŬɔƳŰɤ ɔɦɔɛggʃ:

- Ɓɷ əɔɜɔɷɔɣʃg ɣɟ.ůgɜůʃg΄ɛg ŭŮůɕɜɛgɜ ɛůɷɤɛɣɜd ŰŰɕɨŭŭŰ ŬɔƳŭgɜdʃg ŰŰɤɜ ŮŰɨɛɓɤɜ, əŬɔ ůɕŮŰɓɷƳ ɔɟ.ɛɔɟ.d ŭɛűƳɜɷůd ůɔɷəůɛɛŰŰɛʃg ůŭŭɜ ɛůŰɓɷɛ ΄gəɜɦŰŭŭŰ ůŮ΄ŬɔŭɷŬŰɟɷɛɨʃg ŭɷŬɔdŰɓɷɛɨʃg ŰůdŮɜůgʃŰΓ΄ɛg 2, g΄ɛŭŮɓɷɜɨɛgɜ ɦŰɔd sɓůɛgɔɷdʃ΄Ŭɕůɔɟɦɔɛ ůŭɕ ůɕdɛŰŰɓůɛɦ Űɤɜɛůɔ ůŭŰɨɜ ůŭŭɜ ΄ŮɟɷsůŰŰůpɛ ŮɷűƳɜůɔŭ(΄.ɕ. ɛůŰɓɷɛ ŬɔƳŰɤ ŰgɜdʃgΓ).
- ¢ sɓůɛgɔɷɛ΄ŮɜdŬ΄ɛg ůgɛɓŬɷůɔůŭɕ ƐɛpŰΓ΄ɛg 1 ɛ dŬɔŰůŰŰůd ůŭɕgɛŰŰŰɓɛɔɷɔɣʃgŭɟƳůɔɕgʃŰŭʃdʃ sɓůɛgɔɷdʃgɦ΄ɤʃg΄ŮɟŬŰŭɟŮůŰɔ ůŭɕ ƐɛpŰΓ΄ɛg 2, ůɕŮŰɕɛɜɜŰɔ ɛŰŮůɷɓəŬɓůdʃ ůgɜɤ΄ůɓůdʃɔɷŬŰŭ ůəůɔŰŭɷɛ gɔůdŬ, g΄ɛɔɟ.ŬɛɛɕɛɜŰŰʃg ŰŭɜɜŰɔ ůgɜɛɯɛ ŮɑŭɟŬůd Űŭdʃg sɓůɛgɔɷdʃg ůŭɕɜ ɛůŰɓɷɦ ůɕdɛŰŰɓůɛɦ.
- Ɓ ɛdɕŮɔɜůɛɦʃgŰŭdʃg sɓůɛgɔɷdʃg(insulin-signaling apparatus) ŭɛ΄əɤəŮŰŰɔůŭŭɜ ɛůŰɓɷɛ ŬɔƳŰɤ ŰgɜdəŬɔůŭɔɜ ɛůŰɓɷɦ ůɕdɛŰŰɓůɛɦ.
- Τəɷsɓůɛgɔɷdʃ ɣɟ.ůgɜůʃg Űɦůɛ ůŮ ɕɤɜŰŰɔɛɨʃg ɛɟ.ɔŬɔɜůɛɛɨʃg ɦůɛ əŬɔ ůŮ ŰŰɕɜdŰɦ ΄ŮɟɷɓƳəɷɛɔɛɜ΄ɟ.ɛŰŰɷɛɛɛgɜ ɦŰɔd sɓůɛgɔɷdʃ ɓŬɷŰůɨ ɜŭɔůɛɛɨʃg ůŭɕɜ ɛůŰɓɷɦ ůɕdɛŰŰɓůɛɦ.
- ɟ ɜŮΓɣɟəŭɔŬsɓůɛgɔɷdʃg ůŮɛɜŭɣəŬɕɹι ɤɜ ůɕŮŰɕɛŰŰɔɛŮɔɜɛŮɔəŮɔɤɛŮədŮʃg Űŭdʃgɛəɟ.ɛŮɟɕəŮŰɕɛɜɷəɟg Űɛgɛůŭɨ.

ȳ΄ɤʃg΄ɟ.ɛŮɔŬŰíɣɟdđəŮ ɣɕůɔ΄ŮɟŬŰŭɟ.dđůɒɦŰɔŭůdŮɔůŭʃgɛŮƐŭɔɕŮɟɹ ŭđ qɔŬɔɷŰŭ ɛɨ΄ɛg 1 (Ɛqp ɛɨ΄ɛg 1) əŬɔƐŭɔɕŮɟɹ ŭđ qɔŬɔɷŰŭ ɛɨ΄ɛg 2 (Ɛqp ɛɨ΄ɛg 2) ΄ŮɟɛgůɔƳɛɛgɜ ŭɔŬŰɛɟɣʃgůŰŭɜ ɛůŰɓɷɛ ŰɛgɛŮɟɕɛgɜ ɦŰɔd sɓůɛgɔɷdʃ ɓŬɷŰůɨ ɜŭɔůɛɛɨʃg ůŭɕɜ ɛůŰɓɷɦ ůɕdɛŰŰɓůɛɦ.

ƁɔůəŭɔɷŰŭɔɣʃgŬŰɤɔɷůʃg΄ɛg ɛ΄ɛɟ.ůɒɜŬ΄ŮɟŬŰŭɟ.dđɛɨɜůŮƳɛɛŬɛŬƐqp ɛɨ΄ɛg 1 ΄ŮɟɔəŬɛɓƳɜɛgɜ:

- ʒ Ůɓɤɛɣɜd ɔɟ.Ŭɛɛɔəɛ (linear) ɛůŰɓɷɛ ŭɨɜdůd əŬŰƳŰŭ ŭɔƳɟ.əŭŰŭ ŰgɜdʃgŮɔɔƳɛgɜůdđʃg ŰŭdʃgůŮɣűđɓɛggʃɛŮŭɔŬɓɷŰŭ.
- ʒ Ůɓɤɛɣɜd ɛůŰɓɷɛ΄gəɜɦŰŭŭŰůɛɛggŮɜɛəɔɷůʃg.
- ɟ gɜđɛɣɜɛ əɷŭgɜɛ ɔɔŬɛůŰŭɛ΄ɦɟ.ɤůđ ůɛɛggŮɜɛəɔɷůʃg.
- ɟ gɜđɛɣɜɛ əɷŭgɜɛ əŰŰŬɓɛƳŰɤɜ (fragility fracture).

d Ůŕɜ ɕůŰɜ.

Ůgŭɜ g´Ɣɟɣɕɕgɜ Ůɟəůŕɑ ´Ůɟ ƔɔɕɜůŰůʃ ´ɕg ɛ´ɕɟɕiɜ ɜŰ ůɑɟůŕɕůŰůʃ, ´ɟɕɕŭůgŰůəƔ ɕůŰŰ´ɟůɣɤůdʃɐ ɔŰɜəɦŰŰɟŰ ɦəɤɜ Ůŕɜ ´ɟɕŰɜŰŰíůɟdɣɜŰŕɜ ůəŰəŰŰəɩ ɜ ŭɜŰŰŰɟŰɕɩ ɜ, ´ɕg ´ůɟəɤŰɛƀƔɜɕgɜ:

- ɹ ɜŮŰɟəɐ ůəŰəŰŰəɐ Ůɤɛ ŰŰƔəəɤůd əŰŰƳ Ůɬɜ ŭɔƔɟəŰŰ əɟɑůɤɛɤɜ ´ůɟɦůŭɤɜ Ůɩɜdůdʃ Ůɬʃ ɕůŰəɐʃɛƔɛŰʃ.
- ɹ gɜdɛɣɜd Ŭ ɣəəɟɣůd ŮůƀůůŰɛg ɛɣůɤ Ůŕɜ ɕiɟɟɤɜ, ůŮůgɜŭgŰůɛɦ ɛŮɛŰəɤɛɣɜd Ŭ ɕɟɟɟɦűdůd ŮůƀůůŰɛg, ɕŭdɔɕiɜ ůŮɕɟɦɜəŰŰɜŮ Ɣɟəŭ ŰůƀůůŰɛg.
- Á´ɑŭɣŰůd Ůɬʃɕɟɟɦɜŭʃg´Ůɟɔəgə Ű ɛdŰʃůŰɬəŭŰɛgɟɔdŰŰŕɜ ɕůŰŰɛƀəŰůŰɜ.
- dƀəŰƀůɟƔ Ŭ ɕŰŰəɣůɛŰŰŰ Ŭɦ Ůɬ ůgůůıɟůgůd ´ŮɟŬɟɕɕɦɜŰŕɜ Ůɛg ɛŮŰŰƀɕəəůɛɕi Ůɬʃ ɔəgəɦɛdʃůŰɛɜ ɕůŰəɦ ůɕdɛŰŰůɛɦ.
- Ł ɜůɕgəəɜɕ´ŭɜdŰ
- Ɛ ɕŮŰɛɦɛŭɜdɛŮŰɛɜ ŭɜŭƀɐŰɬ ŭgůəŭŭŰɛgɟɔdŰŰɛg Ɣɜɕɜ ŰGH-IGF.

ɟ´Ɣɟɕɕgɜ ɣɟůgɜůʃ´ɕg ŭŮůɛɜɕgɜ ɦŰɦdɕůŰɛ´ŭɜdŰəŭdɕůŰɛ´ɦɟɤůd ŮɛŭəgɜɣʃŮɘ´əɕəɣʃ Ű ɛƐcpɕi´ɕg 1[77,78], Ůɦůɕɛ ůŮ´ŭəŭƔ[79] ɦůɕɛ əŭəůŮŭɜɐəəəůʃ[80]. qůŰɦůɕɛ, ɣɕŭəŭɜŭíůɟdŮůɦŭəŭŰɛəůʃ ɣɟůgɜůʃ ŭəűɟƔɛɕgɜ ´Ůɟɕɦŭɕggʃ əəɦŰŰɟɕ Ůgůůɬɟɕi ɛŮŰŰƀɕəəɕi ŭəɣɔɕɕg Űɬʃɔəgəɦɛdʃ əŭə əəɦŰŰɟɕ Ů ɕŰŰəůůɛŰŰəɩ ɜ dŰɟŮ ŭəı ɜ ŭəəɕɔɐʃ. Bɵ´ɜɛ ´ɟɦůűŰŰŰʃɣɟůgɜůʃŮɘəůůŭɜɕgɜ ɦŰɦɕ ƐƐcpɕi´ɕg 1 ůɕŮŰɛŰŰƀɛŰŰɜ ɛŮɛŰəɤɛɣɜd ɕůŰəɐ ´gəɜɦŰɬŰŰ[81,82] əŭə əŰŰŰůŰƔůʃgɕŰɛdəɕi ɕůŰəɕi ŭɜŭůɕdɛŰŰəůɛɕi[81].

ŭəŭ´ŮɟƔŭŭəɐɛŰ, ɕɵ Kemink et al[81] ɦɟɐəŭɜ ɦŰɦůŮɣɜŭɜ ´əɖdʃgůɛɦ 35 ɛŮůɐəəɵɤɜ Űůdŭəıɜ ɛŮƐcpɕi´ɕg 1 ɕɤɟɑʃůʃ ɣɔɕɕgɜ ŭəƔəɟɣʃ (ŭəƔɟəŭəŭƐcp: 8,5±3,5 ɕɟɦɜəŰ), Ůɛ 57% Ůŕɜ ɔgɜŭəɐıɜ əŭəŮɛ 67% Ůŕɜ ŭɜŰɟıɜ ŮɑɕŭɜɕůŰɛ´ŭɜdŰ (T-scoreÒ -1 SD) ůŰɬɜ ɕůűgɯɐɐ ɛɕgŰŰɬʃůˊɕɜŭgəəɐʃůŰɛəɖdʃ əŭəůŰɛɜ Ůgɕɣɜ Ű Ůɛg ɛdɟɜŭɑɕg ɕůŰɛi əŭə Ůɛ 14% Ůŕɜ ŭɜŰɟıɜ ´əɖdɟɕiůŮ ŰŰ əɟɜŭŰɟɟŰ ɔɜŰ ɕůŰŰɛ´ɦɟɤůd (T-scoreÒ -2,5). ¢ ɕŰɛdəɐ ɕůŰəɐ ´gəɜɦŰɬŰŰ ůɕŮŰɛɦŰŰɜ ɛŮɕŰɛdəɦŰŰɟŰʃ ɛɣůʃ Ůɛɛɣʃ IGF-1 ´əƔůɛŰŰɛg, Ůəəŭəəɐʃ ű ɤůűŰŰƔůdʃ ɕɟɕi, Ůɵ´ɣűɤɜ ɕůŰŰəŭəůɑdʃ ɕɟɕi, g´ɕŭdəɩ ɜɕɜŰŰʃɛŮəɤɛɣɜɕ ɕůŰəɦ ůɕdɛŰŰůɛɦ ůŮŭʃƔŰŰƔŰɛɛŰ.[81]

Bɛɕɑʃg, ɕɵ Kayath et al[83] ŮɟŮɜdůŭɜ 90 ŭůdŮɜůʃg ɛŮƐcpɕi´ɕg 1, dəəɵdŰʃ 18-54 ŰŰɜ, əŭə ɦɟɐəŭɜ ɦŰɦ Ůɛ 34% ŭgŰɜ ŮɑɕŭɜɕůŰɛ´ŭɜdŰ (Ć-score= -1SD), Ůɜı ɕɵ Munoz-Torres et al[84] ŭɜɣűŮɟŭɜ ɦŰɦ Ůɛ 19% Ůŕɜ 94 ŭůdŮɜıɜ ɛŮƐcpɕi´ɕg 1, dəəɵdŰʃ 20-56 ŰŰɜ, ´əɖdɟɕiůŮ ŰŰ ŭəŭƀɜɤůŰəƔəɟɣʃŰŰɛg ŁBJ ɔəŰŰɬɜ ɕůŰŰɛ´ɦɟɤůd.

¢ ɕůŰŰɛ´ɦɟɤůd dŮɤɟůŰŰɜɛdŰɜɦůɕgʃŰŕɜ Ůɜdəɵɤɜ´ɕg ´ŮɟŰŰɬɟůŰŰɜůŮ´ɟɕɕɤɟɑdɛɣɜd dəəɵdŰ. ƐŰɛɜ Ɛcpɕi´ɕg 1, ɦɛɤʃ, dəŰŰƔůŰŰůd ŭgŰŭɛ ɛ´ɕɟůɜŰɜŭŰəŭŰíɣɟůə, əŭdıʃ´ŮɟŰŰɬɟůŰŰɜŭɜŮ Ůɟəɐəʃ

[illegible][85] [illegible][86] [illegible] BMD [illegible] 1, [illegible] 1. [79,80]

[illegible] 1, [illegible] 2 [illegible]

[illegible] Dennison et al[92] [illegible] 2 [illegible]

[illegible] Barrett-Conner et al[93] [illegible] Reid et al[94] [illegible]

[illegible] Strotmeyer et al[87] [illegible] 2 [illegible] 2 [illegible] 2-8% [illegible] 2 [illegible][88] [illegible][89], [illegible][90] [illegible]

[illegible] 2 [illegible] vs [illegible] vs

[illegible] 2.[76]

[illegible] 2, [illegible] 1, [illegible] (multiracial uniformity) [illegible] (1: [illegible] 2: [illegible]) [illegible] IGF (1: [illegible] IGF- 2: [illegible] IGF). [illegible] IGF-1, [illegible] IGF-1) [illegible][91] [illegible] 24 [illegible] C- [illegible][91] [illegible] 2, [illegible]

❖ [illegible] (in vivo) [illegible] (in vitro) [illegible]

[illegible] 1 [illegible] Einhorn et al[95] [illegible] 1 [illegible]

[illegible] 1, [illegible][96] [illegible]

[illegible] [97,98], [illegible] [99], [illegible] [100]. [illegible] [101]

[illegible] [76] [illegible] IGF-1 [illegible] (PTH).[76]

5.1.2. [illegible] (IGF-1).

[illegible] IGF-1 [illegible] 1/3 [illegible] IGF-1 [illegible] IGF-1 [illegible] [108]

[illegible] 1 [illegible] (cross-activate) [illegible] IGF-1, [illegible] IGF-1, [illegible] [64]

[illegible] IGF-1. [illegible] [64]

ůgɔəɣɜŰɻɤůɖ Ű€g IGF-1 ɕɻɕi ŮœŰəɣɜŰƒ´ɻı œɕɕƒüŮœŰ€ƒɻɤůɖƒ ůŮ´ɻɕŰ£ɛɖɜɕ´ŰgůɵŰəɣƒ əŰə ɛŮŰ£ɛɖɜɕ´ŰgůɵŰəɣƒ GF-1 ɕɻɕi ůŮɜŰŰɻɣƒɔgɜŰœŰƒɛ´ɕɻŰıɜŰ ɓɕɖɖɶůŰə ůŰ€ɜ ´ɻı œɕɖ ŰɜŰɔɜı ɻɵůɖ ŰgŰí ɜ´ɕg ɓɻɶůəɕɜŰŰəůŮəœŭgɜɕ ɔɵŰŰɜ¥ Ű€ɜɔɖ ɕŰ£ɖəɛƒɕůŰəɛƒɛ¥ɕŰƒəŰə ɕůŰŰɕ´ɦɻɤůɖƒ Æ€Ű€ɜ œŭɵŰ ɣɻŰgɜŰ ɓɻɣɣɖɖəŮɦŰəɛ ŭŮœŰ€ƒŰgŰɦƒ ɜŰəœɖůŮɜŰ ɛŰəı ɜŰŰŰə ůŰ€ɜ ɖəɵəɖŰ Ű€ɤɜ 30 ŮŰíɜ, ´Ůɻɖɕg 20 ɕɻɦɜɵŰ ´ɻɕŰɕi ŮɛűŭəůŰŰı ůɖɛŰɜŰəɛ Ű ı əŮəŰ ɕůŰəɛƒ´gəɜɦŰ€ŰŰƒůŰ€ɜ ɕůűgɯpɛ ɛɕɯŰŰ€ƒůɛ´ɕɜŭgəɵɛƒůŰɛəɖƒəŰəůŰɛɜ Ůgɕɣ¥ŰŰɛg ɛɖɻɵŰœg ɕůŰɕi, əŰɾəůŰí ɜŰŰƒŰɛɜ IGF-1 g´ɕɣɐűɵɛ´ɻɕɔɜɤůŰəɦ´ŰɻY¥ɔɕɜŰŰ´ɻı œɖƒŰ ı əŮəŰƒɕůŰəɛƒɛ¥ɕŰƒ.[72]

ÆœŰə ɔɜɤůŰɦ ɦŰə Ű ɦůɛ ɖ ɕůŰəɛ ´gəɜɦŰ€ŰŰ ɦůɛ əŰə ɕɵ ůgɔəŮɜŰɻı ůŮəƒ Ű€g IGF-1 ɕɻɕi ɛŮəı ɜɕɜŰŰəɛŮŰ€ɜ ɖəɵəɖŰ. qůŰɦůɛ, ůŰ€ɜ ɣɻŰgɜŰŰɤɜ Liu Jian-min et al[72] Ű´ ɕŭŮœɖɖəŮɜŰəY¥ŰɻŰ ɦŰə ɛŮɤůɖ Ű€ɤɜ Ů ɔ´ɣŭɤɜ Ű€g IGF-1 ɕɻɕi ůgɛɓŰœŮə ůɢŰɦɦɜ 20 ɕɻɦɜɵŰ´ɻɤɜ ɛɵŰ ůɖɛŰɜŰ£əɛ ɛŮɤůɖ Ű€ƒɕůŰəɛƒ´gəɜɦŰ€ŰŰƒ, əŰɾəůŰí ɜŰŰƒŰɛɜ IGF-1 ŭgɜɖŰəɦ ŭŮœŰ€ƒŮ Ůɻɕɦɛ£ɜɖƒɕůŰəɛƒŰ ı əŮəŰƒ. Æ€Ű€ɜ œŭɵŰ ɣɻŰgɜŰ ɓɻɣɣɖɖəŮɦŰəɛ Ű€ɜ 10,6% Ű€ɤɜ ´ɻɕŰɛɖɜɕ´ŰgůɵŰəı ɜ ɔgɜŰəı ɜ ŮœŰɜ ɐŭɖ ŰɜŰ Ű€ɜɔŮəɕůŰ£ɛ´ŰɜɖŰ, ɛŮɛɣůɕ ɦɻɕ Ű£ɛűY¥əůɐƒŰ€ƒŰŰ 38 ɣŰɖ, əŰə ŰŰ Ůɖ´ŮœŰ IGF-1 ɕɻɕi Ű€ɤɜ ŰŰɦɛɤɜ ŰgŰí ɜ ɐŰŰɜ Ůɖ´ůɖƒ ɛŮəɤɛɣɜŰ. Ó€Ůœ, g´ɕůŰ€ɻɕœŰŰə Ůɵ´əɣɕɜ ɖ ɕɻɖůəɛɦŰ€ŰŰ Ű€g IGF-1 ůŰɜ´ɻı œɕƒɕůŰəɛƒɛ¥ɕŰƒ.

ɻ´Y¥ɻɕɛgɜ əŰə Y¥əəůƒɣɻŰgɜůƒ´ɕg g´ɕůŰ€ɻɕœɛgɜ Ű€ɖ dŰŰəɐ ůgůɕɣ¥ůəɖ ɛŰŰŰɜi Ű€ɤɜ ůgůŰŰŰəı ɜ Ű€g ůgůŰ£ɛŰŰ€ƒ IGF əŰə Ű€ƒɕůŰəɛƒ´gəɜɦŰ€ŰŰƒ (BMD). Æɵ Szulc et al[39] ɓɻɐəŰɜ ɦŰɵɛ IGF-1 ůgůɕŰŰœŰŰŰə ɛŮŰ€ɜ ɛəɵəɐ ɕůŰəɛƒ´gəɜɦŰ€ŰŰ Ű€g ɵůɕœg ůŮ¥ɜŰɻůƒɖəɵəɖŰƒ 19-60 ɕɻɛɜı ɜ. Æɵ Krassas et al[40] ŰɜŰŭɣɻɛgɜ dŰŰəɐ ůgůɕɣ¥ůəɖ Ű€ɤɜ Ů ɔ´ɣŭɤɜ IGF-1 əŰə IGFBP-3 ɛŮŰ€ɜ ɕůűgɯpɛ əŰə ɛɖɻɵŰœŰ ɕůŰəɛƒ´gəɜɦŰ€ŰŰ ůŮgɔɵŰƒŰ€ƒ¥ŰgəY¥ůɵggƒ¥ɜŰɻůƒ. Æɵ Gillberg et al[41] ɣŭŮɐɜŰɜ ɦŰɵɖ ɕůŰəɛƒ´gəɜɦŰ€ŰŰ Ű€g Ůɕɣɜ¥ŰŰ€g ɛɖɻɵŰœg ɕůŰɕi ůgůɕŰŰœŰŰŰəɖŰŰəY ɛŮŰ€ɜ əgəɔɛűɕɻɕi ůŰ IGF-1 əŰə IGFBP-3 ůŮÆɔɓŰŰɕi gY¥Űɻůƒ.

Æ€Ű€ɜ ɣɻŰgɜŰŰɤɜ Jurimae et al[73], ɕɵ Ű£ɛɣƒŰ€g IGF-1 ɣŭŮɐɜŰɜ ɛɖŰ ůɖɛŰɜŰəɛ ůgůɕɣ¥ůəɖ ɛŮŰɣƒɕɻɕi ɛŮɜŰƒŰ£ɛɣƒ ɕůŰəɛƒ´gəɜɦŰ€ŰŰƒ ɛ¥ɕŰƒ əŰə ɕůŰəɛƒ´gəɜɦŰ€ŰŰƒ. qůŰɦůɛ, ɖ ůɕɣůɖ ɛŮŰŰɜi Ű€ƒɣ ůgɔəɣɜŰɻɤůɖƒ Ű€g IGF-1 əŰə Ű€ɤɜ ɛŮŰɣƒɕɻɕi ɛŮɜɤɜ Ű£ɛı ɜ ůŰŰ ɕůŰ¥ŮɐŮɜɕɦŰŰɜ Ű ɦ Ű€ɜ ŮəŮɻɖŮɣɖ əɖ ɕgƒɛ¥ɕŰůŰəƒgɔəŮƒ´ɻɕŰ£ɛɖɜɕ´ŰgůɵŰəɣƒ ɔgɜŰœŮƒŰ€ƒɣɻŰgɜŰŰgŰɛɻ.ɻ Ű£ɛɖəY¥Ůɖ ŮŰŰIGF-1 ɕɻɕi ɣɕɕgɜ´ŰɻŰŰɻɣɖɖůŮəŰŰŰůŰ¥ůŮəƒ´ɕg ɕŰɻŰəŰ€ɻɕœɜŰŰəŰ ɦ ɛŮɤůɖƒ ɛ¥ɕŰəŰəɛŮɤůɖƒ ůŰɜ´ɻı œɕɖ ŰɜŰɔɜı ŭi ɜŰ£ɖ.[28,73]

ɻ ɜŰœŮŰŰ, Y¥əəůƒɣɻŰgɜůƒůŰɛɜ T´ŰgəY¥ůɛ´əɖɖgůɛɦ ŭŮɜ ɣɕɕgɜ ɓɻɵůgůɕɣ¥ůəɖ ɛŰŰŰɜi Ű€g IGF-1 əŰə Ű€ƒɕůŰəɛƒ´gəɜɦŰ€ŰŰƒůŮ¥ɜŰɻůƒɛ ɔgɜŰœůƒ.[42,43,44,45] Æ əɦɔɛƒɔəŰ ŰgŰɣƒŰ€ƒŰůgɛűɤɜɖůƒ ɛŰŰŰɜi Ű€ɤɜ əəɵəɐı ɜ Ůɻɖɕgı ɜ ŭŮɜ ɣɕŮɵŰ ɕůŰíɖɜůŰŰɵ ŰəəY ɛ´ɛɻŮıɛŮɻɐı ƒɜŰ ŮɜɖɔɖɖůŮŰ ɦ Ůƒɜəɣƒɐ űgəŰ£əɣƒŭəŰíɛɻɣƒ. z ŮŭŰœɛɣɜɛ ɦŰɵɛɐ dŰŰəɣƒůgůɕŰ£ůŮɣƒŰ€ƒɕůŰəɛƒ´gəɜɦŰ€ŰŰƒ ɛŮŰ€ɜ IGF-1 əŰə IGFBP-3 ɓɻɣɖɖəŰɜ ůŮɛŰŰ£ɛɖɜɕ´ŰgůɵŰəɣƒ ɔgɜŰœŮƒŰ€ƒHŰɤɜɖŰƒ əŰə Ű€ƒ

[illegible] IGF [illegible]

[illegible]

5.1.3. [illegible]

[illegible] deVernejoul et al[152] [illegible]

[illegible][143]

[illegible] 61% [illegible] (5,8±1,5 [illegible]) [illegible][145] [illegible] 41 [illegible] 17 [illegible][146] [illegible] 17 [illegible] 47% [illegible][147]

5.2. [illegible]

5.2.1. [illegible]

[illegible] (upper-body) [illegible] 10% [illegible][134]

[illegible] Jean Vague, [illegible][130] [illegible][131,132] [illegible][133]

[illegible][136] [illegible][137]

[illegible][138]

[illegible][129]

[illegible]

[illegible] Hayashi et al[151] [illegible]

ەÜG3ەh ەd ɵgf ÛœÜ´œ ÛœɵɵɵœÜ fh hÛœÛ g´Ûjbɵɵەh d Ûx3 ÛjœەgəÛjœüɶx3 Ûɵg û´ەÜG3ەɵi ەý ıüɵggf œÛɵi ɵ3yÜ ûÛł3 ´gəÜœÜ űəyœÜ, ÛÜ ɵ´ɵdÜ ûÛł ûg3yGÛœÜ Ü Ûœ›Ûgd›Ûj ı3ɵ3ÛÜœ Ü Ûgd›ÛœÜgf ûÛɵ ɐ´Ûj.[139] ¢ Üœjœbɐgf ûGyûd ÜœYɐÛœÜ ûÛł3 əŸdÛ3›ÛœxjœÛÉ Ü ɵdɐəd əɵœœ›Üœɵi ەd ɵggf əÜœ ûÛł3 œsûɵgəœœɵÜœÛœûÛÜûd üÛœ ÛœÜœ 3Û›YdÜjd, əhɔx Ûx3 Üœ3ÛœjɵgɳɐÛœxɜ Ü ɵÛÛœ›ÛœɐŸÛx3 Ûx3 üœÜûɳjx3 Ûj Ûgɜı 3.[129]

¢Ü Ü ɵÛÛœyûɐÜÛÜ Ûł‹gf yjÛgɜÜgf Ûx3 Nielsen et al[140] üÛœG3ɵg3 fhÛœ d ûgɐbɵəɐ Ûx3 Û›Ûıd›Ûjx3 əý Üjı3 ɵ3yx3 ´ɵg ɐÛÛÛíyjɵ3ÛÜœÜ fh Ûɵ û´ەÜG3ɵɵɵ ەd ɵgf ûÛł3 ´gəÜœÜ űəyœÜəÜœ Ûœɵəɵi dx‹gf ûÛł ûgûÛł‹ÜÛœɐ əgəəɵűɵjœÜ, ÛœÜœ ɐÛœÜœ›ÛÛj d fhÛÜœ ɵ û´ەÜG3ɵɵɵhgf əý ıüd‹gf sûÛhgf ÛœÜœ Üg3d‹ɐy3ɵgf.

Bɵ Goodpaster et al[127] bjɐəÜœ fhÛœ Ûɵ g´ɵühjjsɵ ɵɵɵɵÜœɵɵh ɵd ɵgf, x‹gf ûgûÛÜÛœɵɵh Ûł‹gf əÛœÜj3ɵi Ûi´ɵg ´Üœgû Üj3ɵdÜgf, y‹GÛœÛɵ œûɵɵ sûɵggjɐ ûgûɵy›Ûœûd ɐÛÛł3 sûɵgəœɵɵÜœÛœûÛÜûd fhûɵ y‹GÛœəÜœÛɵ û´ەÜG3ɵɵɵh ɵd ɵgf, Ûœı d ÛdjÛÜdjÛÜûɐy3d‹ɐgupɐ ûi›ûÛÜûd, fh´x‹gf´jɵəi´ÛÛœÜ fh Ûɵ Üg3d‹ɐy3ɵɐ əý sûɵɵh ´Ûj3ÛgɳɐÛœɵ, ÛœÜœ y3Ügf ûd‹ɐÜœÛœɵɵhgf Ü›Û›Yjûł‹Ûɵgf ´Üj›Yɔɵ3ÛÜgf sûɵɵgəœɵÜœÛœûÛÜûd‹gf ûÛł3 ´Üœgû Üj3ɵdÜ. Ɐ ÛjœsûɐyɜÜ´Üœi›ûÜj3ɵÜ›Yœ‹ɐÜ, d Ü Û›Ûgd›yjx›ûd əý Üjı3 ɵ3yx3 Ü fh ÛÜ Ûj3ɵəgəÛj‹sûɵ Ûɵ ûÛł3 ´Üœgû Üj3ɵdÜgf, x‹gf ûgûÛÜÛœɵɵh ɵd ɵgf, Ûœı d Ûd‹ɐÜœÛœɵɵhgf Ü›Û›Yjûł‹Ûɵgf ´Üj›Yɔɵ3ÛÜgf ûÛł3 Ü›Y Ûg3d d´ÜÛœɵɐgf sûɵggəœɵÜœÛœûÛÜûd‹gf. q ûÛhûɵe, d g´Ûjbɵəɵɵe Ü Û›Ûgd›yjx›ûd əý Üjı3 ɵ3yx3 Ü fh Ûɵ û´ەÜG3ɵɵɵh əý ı üd sûÛh üÛ ûÜœûÜÜœ 3Ü ÛœÜœ ûd‹ɐÜœÛœɵɵhgf ´Üj›Yɔɵ3ÛÜgf ûÛł3 ´Üd‹ɔy3Ûûd ÛłGf sûɵggəœɵÜœÛœûÛÜûd‹gf ûÛɵggf ûəÛ›ÛÜœɵi‹gf ɛi›Ûgf, Û Û›ûɐɐ Ü›Ûý´jɵûx´Ûi Û›y3Ü´ɵəi ɛɵjɳ´ɵûɵûhÛ Ûx3 ûg3ɵəɵɵı3 Û›Ûi‹Ûgd›yjx3 əý Üjı3 ɵ3yx3 ´ɵg Ü Û›Ûgd›Ûj ı3ɵ3ÛÜœ ûÛɵggf ɛgupɵi‹gf sûÛɵi‹gf.[129]

¢ ´Ûjsúíyjû›ÜÛ ɛy›ûd‹gf cjd›ûsɛ´ɵəûÛÜœ ûgG3Ÿx‹gf üÛœûÛł‹gf Ûɵg əd ɵggf Ûł‹gf ´Ûjsɵcɐ‹gf Ûł‹gf əɵɵəŸGf, Û Û›ûɐɐ ûgûɵGÛÜɐÛÛÜœûÛÜ3Ÿɛ ÛÜɵ3 ɵəɵɳh əý ı üd sûÛh ûÛÜgÛɐ Ûł3 ´Ûjsɵcɐ, fh´x‹gf ɛÛÛjŸÛÜœɛÛÜɵ3 d›Û›Ûj ɵ3yhÛ ɵɛɵcjŸû ɵ.[135]

j 3Üûɵjsɵ Ÿɛ ÛÜł ɛgupɐ ɛŸɵÜ ûɵɵggf Ûsɐəɵûgf, y‹GÛœbjûÛûhÛœɵ´jɵûÜjɛɵcyg´ɵg ´jɵəÜɵɵi3ÛÜœ ûɵɵggf ûəÛ›ÛÜœɵi‹gf ɛi›Ûgf Ü fh Ûł ű gûsɵɐ ükÜûÛł‹jhÛł‹ÜÛ g´ɵəɵɵi3ÛÜœ Ü fh Ûɵ´ɵɵi‹gf ɛd‹GÜ3ɵÛgÜûd‹dÛɵggf ɛd‹GÜ3ɵûɛi‹gf, ɵɵ´ɵɵɵűÜœûÛÜœhÛœ´Ûjɵ›ÜɛbŸ3ɵg3 üɵŸűɵj‹ɵggf Ügɜd‹Ûɵi‹gf ´Üj›Yɔɵ3ÛÜgf əÜœ ɵj‹ɛfɜÛgf. Ÿɵɐ ûgɔəÛœjɐɐy3Ü, Ûɵ Û3üɵÜíyjɵ3 y‹GÛœ ´jhûúÜÛÜ ÛûÛ3ÜûdÛû ûÛł3 Ügɜd‹Ûɐɵe ɵj‹ɛfɜd (GH) əÜœûÛɵ ûi›ûÛł‹ÜIGF. ȳûɵ3 ÜűɵjŸûÛł3 ɵɛɵɵfhûÛÜûd Ûx3 ûəÛ›ÛÜœı3 ɛgı 3, ɵ IGF-1 dÛxjÛdÛÜœfhÛœüɵÜɛÛûɵəÜœÛûd´Ûjsûûhíjûgf Û sűŸŸûÛgf Ûł‹gf Ügɜd‹Ûɐɵe ɵj‹ɛfɜdgf. Á´ûdgfúÜœÛÜœfhÛœɵ IGF-1 əÛ›Ûɵgjɔûɵ‹ÛyɜÜœ ÜgÛɵəjɐɐ-´ÜjÜœjɐɐ Ûjh´ɵ ûÛɵggf ûəÛ›ÛÜœɵi‹gf ɛi›Ûgf Üœ›Û›Yjûł‹ÜÜ Ü fh Ûł3 Ügɜd‹Ûɐɵe ɵj‹ɛfɜd.[141]

ӛӭ Ů ơủ Ŭůd ủŉg IGF-1 ủŉgg ůəŬŭŭőӧǿ ɛɨ Ŭűǿɔ Ŭ
Űűǿdǿ ´ ɟ ɤ ŰŬɜdǿ-ɞ ŭŬŭ Ŭűǿ ŬgŰƞǿ ŬɞŬ Ů ơdǿ ɘŬɜƞǿ ɜŬ
Űǿɜ ŭɘŬűɞɟɞ´ɞdůd Űɤɜ Ŭɟɞɣɔɞɜɤɜ ɛgɰɩɜ əgŰŰɟɤɜ.
ɟ ´ɞŰŰ ůɛŬŰŰ Ŭƞ ɏɟŬgɜŬǿ ůŮ ´Ŭɟ Ŭɛ ŬŰƞɞɤ Ŭ ´ɟɞŰŬɞgɜ ƞŰ Ŭgŭ d ŭɘŬŭɘŬůdŬ ŬɞŬ
Ŭ Ŭɟ Űűǿ ɔɘŬɜŬ´ɟɞɤɟɐůŬd ɛgɰɐ g´ ŬŬ ɞűdŬ.[142]

5.2.2. ŰŬŮ ơ ŬŭŬűŬɟɘŰɞdǿ

ŀůɞgɟƞ ŬŭgɜdŰƞ ŬɜŭɘŬűɏɟɞɜ g´ ŰɟɞŬ ɔɘŬŰǿ ůgůɞɏŰůd Űɤɜ Ů ɘ´ɏŭɤɜ űŬɟɘŰɞdǿɞɟɞɨ ɛŮŰ
ůɤɛŬŰƞ əơɞǿ. dŭŰƞůɞ, ɞɘ ɏɟŬgɜŬǿ ´ɞg ɏɞɞgɜ ŬɘɞəɞɔɐůŬ Űǿ ůɞɏůŬǿ ´Ŭɞgŭ Ŭɟ əŬǿ əŬ
əŬɜŰɟɘɞɨ Ű´ɞg əŰŰɜɞɛɐǿŰg əơɞgǿ ɛŮŰ ůgɔəɏɜŰɤ ůd Űǿ űŬɟɘŰɞdǿɞɟɞɨ, əŰŰəɐɔɞgɜ ůŮ
ŬɜŰűŬŰŬ ŸŬ ɞŰŰɏůɛŬŰŰ.[123,160]

Ƀɘ Oshaug et al[123] ɛŬɏŰůŬɜ ɛdŬɞɛ ŸŭŬ ʔɞɟ ɓdɔɩ ɜ Ŭɜŭɟɩ ɜ əŬ ɓɟɐəŬ ŬɜŬŸ ŰŰ ůgůɞɏŰůd
Űǿ űŬɟɘŰɞdǿ ŰŰg ɞɟɞɨ ɛŮŰ əƞɔɞ Űǿ ɛɏůdǿ ´ɟɞǿ Űgǿ ɛdɟɞɨ ǿ (waist-to-thigh ratio, WTR)
ŬəŸ əŬ ɛŮŰ ɸŬŰ ɀ ŸɞŬǿ Ɇɩ ɛŬŰǿ (ɸɀ Ɇ). ¢ Ů ơɟ Ŭůd Űg ŭŬŰ WTR ɐŰɜ ɔɟ Ŭɛ ɘɐ əŬ
ŬɜŬŸ ŰŰ Űg ɸɀ Ɇ.

ɆŮ ɛdŬ ɏɟŬgɜŬ Űɤɜ Fernandez-Real et al[124] ƞ´ɞg ůgɛŰŰŬɞŬɜ 36 gɔɘŬǿ ŰŬɞɜŰǿ, ŭŬɜ ɓɟɏdəŮ
ůgůɞɏŰůd Űǿ űŬɟɘŰɞdǿɞɟɞɨ ɛŮŰ əƞɔɞ Űǿ ɛɏůdǿ ´ɟɞǿ Ű ɘůɞɞ (waist-to-hip ratio, WHR),
Ŭɜ əŬ ɓɟɏdəŮ ůgůɞɏŰůd Ŭgŭǿ ɛŮ Űɜ ɘůɞgəɘɞŬgŬůdůdŬ ůŰŰ ŸŰɛŬ ´ɞg ŬɜɐəŬ ůŰ
Ŭɜɩ Űɟɞ ɛɘůƞ (upper half) Űǿ əŰŰɜɞɛɐǿ Űǿ űŬɟɘŰɞdǿ. Ʉɞ ůgɔəŬɟɛɏɜŬ, ŰŬŮ ơ ŬŭŬ Űǿ
űŬɟɘŰɞdǿ ɞɟɞɨ ůɞŰŰɜŰŰɜ ɛŮ ɛŬɤɛɏɜd ɘůɞgəɘɞŬgŬůdůdŬ əŬ Ŭgɜdɛɏɜ ŬŮ ơ ŭŬŬ
ɘůɞgəɞdǿ ɜdůŰŰŬǿɞɟɞɨ əŬɔəgəƞɞdǿ ŬɐŬŰǿ.[124] ɟ gŬɏǿ ɞɘ ŬɜɤɛŬəŬǿɛ´ɞɟɞɨ ɜŬɞűdɔɐůɞgɜ
ůŮ Ŭgɜdɛɏɜ ´ɞůɞůƞ ůɤɛŬŰɞɨ əơɞgǿ. ɆŮ ɞɟɘůɛɏɜŬǿ ɏɟŬgɜŬǿ, d űŬɟɘŰɞd Űg ɞɟɞɨ
ůɞŰŬƞŰɜ ɛŮŸəŬůgůŰŰŬŸ Űg ůgɜŭɟƞɛɞg Űǿ ɘůɞgəɘɞŬŰŬŰůdǿ.[124,125]

Ƀɘ Gillum et al[121] ŬŮ ɜdůŬɜ ɀ ŬɘŸɜɞgǿ Ÿɜŭɟŭǿ dəɘdŬǿ 20-49 Űɨ ɜ əŬ ɏŭŬŮ dŰŰɐ
ůgůɞɏŰůd Űɤɜ əƞɔɤɜ ɛɏůdǿ ´ɟɞǿ ŰůɞɞɞWHR), ɛɏůdǿ ´ɟɞǿ ɛdɟɞɨ ǿ(WTR), SFR (subscapular to
triceps skinfold ratio) əŬ CPR [(subscapular and suprailiac)/(triceps and thigh)] ɛŮŰŰ Ů ơ ŬŭŬ
űŬɟɘŰɞdǿɞɟɞɨ ŬŸŬŭŬůŰǿ dəɘəŬɏǿ g´ ɞɞɛŸŭŬǿ Ŭgŭ ɜ. ɭ ůŰŰŬ Ŭ Ŭƞ ɏəŬɞɞ ɔɘŬŰɜ dəɘdŬ
əŬ Űɜ ɸɀ Ɇ, ɞ əƞɔɞǿ ɛɏůdǿ ´ɟɞǿ Űůɞɞɞ (WHR) ŬŬɞəɞgdɞɨ ůŮɜŬ ůɞŰŰɛŰŰŬ ůdɛŬɜŬŸ ɛŮŰŰ
Ů ơ ŬŭŬ űŬɟɘŰɞdǿɞɟɞɨ, ŬəŸ d ůgůɞɏŰůd Ŭgŭ ŬŬůdŬɞɨ ůŮɛŮŰɜ Ŭɨ ɜdůd Űǿ dəɘdŬǿ əŬ
Űg ɸɀ Ɇ. O əƞɔɞǿ ɛɏůdǿ ´ɟɞǿ Űůɞɞɞ əŬ d ´ Ŭűɏ ŬŬ ɛɏůdǿ Ŭűɟ Ÿɞgɜ Ű ŬŭɞəɞɘŬƞ əơɞǿ
ůŮ Ŭɐəɘŭǿ Ÿɜŭɟŭǿ.[126] Ƀɘ ŭŬŰŰ SFR əŬ CPR Ŭűɟ Ÿɞgɜ Űɜ əŰŰɜɞɛɐ Űg g´ɞűƞɟɞg
əơɞgǿ.[121]

Ƀɘ Iwasaki et al[111] ɏŭŬɜŬ ƞŬ d űŬɟɘŰd Űg ɞɟɞɨ ůgɞŰŰŰŰŬ ůdɛŬɜŬŸ ɛŮŰ ů´ əŬɜɘƞ
əơɞǿ (p< 0,0001) əŬ Ű g´ɞűƞɟɞ əơɞǿ (p=0,0005), ƞ´ɤǿ ŬŰɐdəŬ ɛŮŰɜ dəŬŰɞɜɘƞ

Ü Ûłз dəəədÜ əÜə Ûćз űi÷æe, d ůgɔəy³ÛĵxůdqÛłgfűÛĵ¡ə¡Ûćsdgf ůdɛÜə³ÛćY ɛÛÛćůˊəÜG³əəhj əÜəÛćg´cüñĵ¡əs æ¢cgf. z ĥ³ɛ ůG÷ůdqÛłgfůgɔəy³ÛĵxůdgfÛłgfűÛĵ¡ə¡Ûćsdgf e¡ei÷ ɛÛÛćggf üəYűce¡cggfüÛəÛĵ´ÜcgůÛĵəd¡Ûgf. ÆÛłз y¡Ůg³ÜÛx³ Iwasaki et al[111] ɔœÛĵÛə d´¡ı ÛłqÜə³ÛűceĵY´cg ´Ûĵcgůə÷Yć¡Ûə ÜŮgdÛœÛĵgf ůG÷ůdqÜə³Yć¡ÛıÜ ůÛłq űÛĵ¡ə¡Ûœdqf Ûćg e¡ei÷ əÜə ůÛć ůˊəÜG³əəhj əÜə Ûć g´cüñĵ¡əs æ¢cgf.

¢ Ü³ɛdɛy³dq ŮˊedɛəÛgůdq ůəüɛ¡cg ůÛć ɐˊÛĵ dÛx¡ÛœÛĵə ĥÛə´¡cəÜə÷Ûœs œůcgə÷œcÜ³ÛœůÛĵÛůd, ɛÛ ɛÛə÷ɛy³dq əÜ³ĥÛłqÛĵÜ Ûłqfœůcgə÷œdqf ³Ü əÜĵÛĵůÛĵəə÷Ûə Ûłз d´ÜÛə÷ɐ ´Ûĵ¡Ü³x¡ɔɐ ɔə÷gəĥɛdqf. ¢Ü ÛˊdˊÛœÜ ÛłqfűÛĵ¡ə¡Ûœdqf e¡ei÷ ůcÛĵœɛ³ÛĵÜə ɛÛɛÛə÷ɛy³dq œůcgə÷œcÛůÜ³ůˊdqůdÜ əÜə ɛÛÜg³dɛy³Ü ÛˊdˊÛœÜ œůcgə÷œdqf ´ə÷YůɛÜÛćgf ³dqůÛĵÛůÜgf əÜə ɔə÷gəĥɛdqf.[124] ¡ gÛ¥gf ɛə Ü³x¡ɛÜə÷ůqf ɛ´e¡Ûˊ³Ü ɛüdɔɐůcg³ ůÛ´Ü³gůÜ¡əd.[111]

Þ ůdɛÜ³Ûə÷ĥgf¡ĥə÷gf Ûłqfű Ûĵ¡ə¡Ûœdqf Ûćg e¡ei÷ ůÜ³ üÛə÷Ûłqf Ûćg ůx¡ɛÜÛə÷ei÷ æ¢cggf-əg¡ɑx gf Ûćg ů´əÜG³əəei÷ Üəə÷YəÜə Ûćg g´cüñĵ¡əsg əcəə÷əÜə÷ei÷-əÜə Ûłqfœůcgə÷œcÜ³ÛœůÛĵÛqf, ű Ü³ÛœÛĵÛə Ü ĥ Ûć ɔÛə÷³ĥgf ĥÛə e¡ɐůɛy³ɔɐ Ûĵ Ůg³dÛ¥gf ¥G÷gg³ ´¡ɐÛĵœÛə ³Ü Û³ÛĵÜG´dÛˊɐ ůgɔəÛə¡ɐɛy³ɐgf üÛə÷Ûłqf ůÛĵÜ ůgůÛĵÜÛə÷Yć¡g ůg³üy¡ĥɛɐg Ûłqfœůcgə÷œcÜ³ÛœůÛĵqf.[124,148]

[illegible] 41 [illegible], 34 [illegible] 7 [illegible]. [illegible] (41 [illegible]) [illegible] (34 [illegible]) [illegible] (7 [illegible]) [illegible].

❖ **[illegible]**

- [illegible], [illegible]: [illegible], [illegible].
- [illegible] 24 [illegible], [illegible].
- [illegible] WHR, [illegible]) [illegible]). [illegible] (D-XA) [illegible]).
- [illegible].
- [illegible] (Amsterdam Growth Study Questionnaire).

❖ **[illegible]**

[illegible] metabolic [illegible] kilojoules (kilocalories) [illegible] kilojoules

[illegible] 1 [illegible] 4.2 kJ [illegible] 3.5 ml O2 [illegible]

[illegible] (Amsterdam Growth Study) [illegible] Verschuur [illegible] Kemper (1987). [illegible] 4 [illegible] (score) [illegible] 4 [illegible] 5.5, [illegible] 8.5 [illegible] 11.5). [illegible]

[illegible] «Amsterdam Growth Study» [illegible] 4 [illegible] 2) [illegible]

əŬŰŸ Verschuur əŬə Kemper (ŮəŬűɹɘŸ, ɛɣŰɟɘŬ əŬə ƀŬɟɘŸ), ŬůŰŰɱɹɘɑŰɐŰŕɜ ´ɘg ŭŮɜ əŬɛƀŸɜɘɜŰŰə g´ɦɣɋ (əŬŰɱɔɘɹɑŬ 4[d]:

Ʉɑɑ̈ŮəŬɑɑ̈ɑ̈ũ.1 ƬŬŰɱɔɘɹɘ´ɘɑɱůɋ ŰɱɑɑŮɟɔŬůɑŬɑɑ̈, Ÿůəɑɱůɑɑ̈, ŭɣ ŬůŰɱɹɘɑŰɐŰŕɜ ŬɜŬŷgɑɛɑɑ̈ůŮ4 ɛɛŸŭŮɑɑ̈ ɛŮƀŸůɋ Űɱɜ ɛɣůɋ ůgɑɜɦŰɱŰŸŰɛgɑɑ̈ůŰɛ əŬɟŭəŬɔŮəŬəɦ ůɨ ůŰɱɛŬəŬəůŮg´ɛɑɛŸŭŮɑɑ̈ůɨ ɛűɤɜŬɛŮ ŰɱɜŮ ɑ̈ŭɣŬůɐ Űɛgɑɑ̈ůŰɱɜ ɑůŰəɐ´gəɜɦŰɱŰŰ.

ɑɑ̈Ɉ ΛƬ ΑŁɟ ū ɟ ƐŁƬ¢Ɛ ɑɑ̈Λɟ Ɛɛ¢ ΛŁBɛ¢ ɛ ɟ Ɛ > 30 əŮ ŰŸ	
A1	ΑəŬűɹɘɣɑɑ̈ ɛəɘɑŬəɣɑɑ̈ Ůɟɔ Ůůɑɑ̈ůɑɑ̈ ɦ´ɤɑɑ̈: ´əɨůɘɛɑ ´ɘŸŰɤɜ, əŬɱŮɹɘůɛɦɑɑ̈ ūŰ ɣūɤɜ, ɛŬəŮɣůɛŬ
A2	----------
A3	BɟɑɛůŰŰůɑŬ-əŸɑɑ̈ůɛŬ, ɀ ´ɘəɘŸɟūɛ, Ɛəɛ´ɛƀɛəɐ, ūəɛəűú, ƇɤɔɟŬűɘəɐ, ƐŰɦɑŮɣůɑ ɛŮƀɣəɑ, ƬɟɹœŮŰ ūɦɔəŬ, ƐəŸəɘ, ƇŸɟůɛŬ, ɀ ´ɦɛgəɘɘɔəɘ, ĦůŰɯ´əɛɑŬ
B1	Mɣůɑɑ̈ ɣɜŰŰůɑɑ̈ ŭɣŬůŰɱɹɦŰɱŰŰɑɑ̈ ŬəŬŷgɑɛɑɑ̈ ɦ´ɤɑɑ̈: Ƭɑɑ̈´ɛgɟɹɘɐ, ɀ ŮŰŰűɛɟŸ ɔəŬůŰɟɩɜ, ɔɐůɘɛɛ əŬə əŬɑɑ̈ŸɟɹɑůɛŬ ŭŬ ɣūɤɜ, ɀ ŮŰŰűɛɟŸ ŬəŰɯůəůɛɣɜɤɜ, ÁɟɔŬůɑɑ̈ůɑɑ̈ɛŮɑɟɐůɑ ůűɑgɟɹɘɨ, ƐəŸɣɘɛɛ
B2	Ɛəɑ ƀɛgɜɛɨ, ɑŬəŸůůɘɘ ůəɑ, ĦŮŰɛůűŰŬɟɹɑůɑ, ɀ ´Ůəɣɑɛ, ɟ ɛɟɦɑɑ̈, ƬŬəəɘŮŰɑɜəɦ ´ŮŰɯŸɛ, ɟ Ůɟɛƀɘəɐ (ɛɣŰɟɘŬ ɣɜŰŰůɑ), Ĥɘɔɔə ´ɦɜɔə, ɀ ´ŸɜŰɛɘɯŰɛɜ, Ÿůəɑɱůɑɑ̈ ɛŮƀŸɟɑ
B3	Ĥɛŭɑɑ̈əŬůɑŬ (ɔɘŬ ŮɟgɑŬɟɑůŰɱůɑɑ̈), ƬɤŸ´ɑɑ̈əŬůɑŬ, Ł´ŬůɑŬ, ƬŬəɦ, ĤŮɟ´ŸŰɱɛŬ, ĤŬŰɯŸɛ, ĦůŰɯůəŬəɑŬ, ɀ əíŬůəɑŬ
ũ1	ɟ ɔɟɛŰɯɣɑɑ̈ əŬəɛɘəɛŭɛɛəɣɑɑ̈ Ůɟɔ Ůůɑɑ̈ůɑɑ̈ əŬə ɔŬɯəŸƀŬɟɣɑɑ̈ ɑŮɟɤɜŬəŰɯɣɑɑ̈ Ůɟɔ Ůůɑɑ̈ůɑɑ̈
ũ2	ɟ ɜŰɯůűŬɟɣɑůɑ, ĤɛŭɦůűŬɟɣɛ, ɟ ŮɟɣɛůűŬɟɣɑůɑ, ɟ ɜɣƀŬůɛŬ ůŮ ƀɛgɜɦ-ůəŬɯ´ŸŰɯŬ, ƐŰƀɛɑ, BɟŮɯƀŬůɑŬ, ɟ Ůɟɛƀɘəɐ ɛŮůŰɟ´, ĤɛɘŮɛəɣɑ ŮɟɣɑɜŰɑ, ɛɟɣɜɘɛɛ, ɟ Ůɟɛƀɘəɐ ɣɜŰɛɜɑ ɛŮ ƀŸɟɑ, ɟ ɛŮɟəɘŸɜəɘ ´ɛŭɦůűŬɟɣɛ,

	ɹ ɔʏ ɜəůŰəɦ Ű̃ɟʏɜɘɛɵ
	ůŰɵ´əɵŧŰ, TŰŰŸűgůd ɛŮŮɵ´əəůɛɦ, ɄɵűdəˇŰůdŰůŮ ɓɵgɜɦ, TŰɜɦ, TʏˊdəˇŰůdŰ
qp1	----------
qp2	ȳ əˇŮƒɵɘűɟˇŰůŰɟɦŰŰ[ŰŮƒˊɵgˊŮ̃ɟəəˇŰɛɓŸɜɵɜŰŰəůŰ[əŰŰ[ɔɵɟdŰ ũ2 Ŭəəˇ Ű̃ɵɟɵɨɜ Ŭɔʏ ɜəůŰəɒɛ ůgɛɛŮŰɛɢɛ (Ů Ŭɔɔůəɛ ŰŰəɒɛ) ɐ Ŭɔı ɜŰ
qp3	ɹ ɔʏ ɜəůŰəɒɛ ˊɵűdəˇŰůdŰ əŰə ɦəˇŮƒ ɵɘ űɟŰůŰɟɦŰŰ[ŰŮƒ ˊɵg ˊŮ̃ɟəəˇŰɛɓŸɜɵɜŰŰə ůŰ[əŰŰ[ɔɵɟdŰ ũ3 Ŭəəˇ Ű̃ɵɟɵɨɜ Ŭɔʏ ɜəůŰəɒɛ ůgɛɛŮŰɛɢɛ (Ů Ŭɔɔůəɛ ŰŰəɒɛ) ɐ Ŭɔı ɜŰ

A: gŰɛ dəɐɛƒʏɜŰŰůdƒɔɘŰŰɛ əŰɟ ůɘŰɔůɵŰəɦ ůɨ ůŰ[ɛŰ (<4 METS)

A1: gŮɵɟʏɜŰəŰɵɐɛ Ůɟɔ ŰůůdŰ gʏɟ ɑƒŮ ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

A2: gŮɵɟʏɜŰəŰɵɐɛ Ůɟɔ ŰůůdŰɛŮɛʏŰɟɘŰʏʏˊƒgɣdəɐɛ Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

A3: űɟ ŰůůŰɟɦŰ[ŰŰ ŰəŰɣgɢɐƒgʏɟ ɑƒɐ ɛŮŮəˇŸgəůŰ[Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

dɒ ɛʏŰɟɘŰƒʏɜŰŰůdƒɔɘŰŰɛ əŰɟ ůɘŰɔůɵŰəɦ ůɨ ůŰ[ɛŰ (4-7 METS)

db1: gŮɵɟʏɜŰəŰɵɐɛ Ůɟɔ ŰůůdŰɛʏŰɟɘŰʏʏˊƒgɣdəɐɛ Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

db2: űɟ ŰůůŰɟɦŰ[ŰŰ ŰəŰɣgɢɐƒgɛŮɛʏŰɟɘŰʏʏˊƒgɣdəɐɛ Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

db3: űɟ ŰůůŰɟɦŰ[ŰŰ ŰəŰɣgɢɐƒgʏɟ ɑƒɐ ɛŮŮəˇŸgəůŰ[Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

ũ: gɣdəɐɛƒʏɜŰŰůdƒɔɘŰŰɛ əŰɟ ůɘŰɔůɵŰəɦ ůɨ ůŰ[ɛŰ (7-10 METS)

ũ1: gŮɵɟʏɜŰəŰɵɐɛ Ůɟɔ ŰůůdŰɛŮɛʏŰɟɘŰʏʏˊƒgɣdəɐɛ Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

ũ2: űɟ ŰůůŰɟɦŰ[ŰŰ ŰəŰɣgɢɐƒgɛŮɛʏŰɟɘŰʏʏˊƒgɣdəɐɛ Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

ũ3: űɟ ŰůůŰɟɦŰ[ŰŰ ŰəŰɣgɢɐƒgʏɟ ɑƒɐ ɛŮŮəˇŸgəůŰ[Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

qɒ ˊɵəɨ gɣdəɐɛƒʏɜŰŰůdƒɔɘŰŰɛ əŰɟ ůɘŰɔůɵŰəɦ ůɨ ůŰ[ɛŰ (≥10 METS)

qp1: gŮɵɟʏɜŰəŰɵɐɛ Ůɟɔ ŰůůdŰɛŮɛʏŰɟɘŰʏʏˊƒgɣdəɐɛ Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

qp2: űɟ ŰůůŰɟɦŰ[ŰŰ ŰəŰɣgɢɐƒgɛŮɛʏŰɟɘŰʏʏˊƒgɣdəɐɛ Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

qp3: űɟ ŰůůŰɟɦŰ[ŰŰ ŰəŰɣgɢɐƒgʏɟ ɑƒɐ ɛŮŮəˇŸgəůŰ[Ů ɑűɟ ŰůůdˊůŰ[ɜ ɵůŰɵɐɛ ˊgəɜɦŰ[ŰŰ

g

eg ûgɛɛÛÛÛûGÛ3 ûÛ[l ɛÛ»yÛ[l ɛÛÛjɐdd]ɘÛɛÛɛdÛ ɣd[ûɕ9Û»ɐ ɛgɔÛjɕ9Ɣ (Seca) ɛÛÛ»jɑbÛ9Û ±100g. ɸÛ g´ɕɘÛœÛ3Û Û[dg ɛÛ»yÛ[dg ɛgɔɑûÛ[ɘÛ3 GɤjɑgƷ3Û ű¢jɕi3 g´ɕüɐɛÛÛÛɘÛ»ɛÛÛ[3 Û»Ɣɕɑû Û[l ügɜÛÛɐ y3ügûd. ɸɕi ɣɕgÛ£ggÛɛÛÛjɐdd]ɘÛûÛhjɑd9ÛûÛƔûd, GɤjɑgƷ 3Ű¢jɕi3 g´ɕüɐɛÛÛÛɘÛ»ɘjÛÛí 3ÛÛgÛ£ggÛı ɛɕggÛûÛGÛ»Ûjɐ dyûd, ɛÛÛÛGyjɘÛ3Û ɘjɣɛɕ3ÛÛ» Û»ûdÛjÛ Ű ɦ Û£ggÛı ɛɕggÛ, ɛÛÛ[l GɣɐûdÛ»ɦgÛ3ÛûÛ[ɛɦɛÛÛjɕg Û£g Û£´ɕjɑœg ɘÛ» ɛÛÛ»jɑbÛ9Û ±0,5cm. j´ɦ Û£g´ÛjŰƔ3ɤ Û3djɤ´ɕɛÛÛjɐûÛ£gÛg´ɕ»ɕɑû Û[dÛ»Ûɕ qÛûÛ[dgƵ Ɣ£ÛgÆı ɛÛÛ£gÛ(qpƵ Æ) Ûɤ3 Û»ÛÛÛ£ɕɛyɜ3ɤ3, ügÛjɣı 3ÛÛgÛ£ɕ ɓƔjɕgÛ(kg) ɛÛÛ£ ÛÛÛjƔ»ɤ3ɕ Û£gi ɣɕggÛɤ3 (m^2).

- **ƶ ɣÛjdûd´Ûjɘűûjûɘı3:**

ȳÛÛ3 GjÛƔ£ɕ3ÛÛ3 Ůɘ´jɦûdÛÛÛg´ɘdjɕűɕjdûgƶɕÛ Û[l3 Ü»ɕɑɦɔdûd Û[dg´jÜ»ɛÛÛɘɐgÛ ûi ûÛÛûdgÛ ûı ɛÛÛ£gÛɤ3 Ûd[»ɕ3Ûı3, ɛ´ɕjÛıɘÜ»ÛûgƷ3Ü´jɕ6ÛıûÛÜ3dɣɤ´ɕɛÛÛjɘ»ygɛÛÛjɐûÛ»ɦ´ɤgÜGÛ»g Ûɤ3´Ûjɘűûjû»ı3 Û£gûı ɛÛÛ£g,´Ûjɘűiyjû»ÜɛyûdgƶÛ»´Ûjɘűiyjû»ÜɘÛ»Ɣ3dgƶÜ»´Ûjɘűiyjû»ÜÛjɘûÛjɕi ɓjÜGœ3Ü. J´ɕɘɔœ3ÛÛg´Ûjɘűiyjû»ÜɛyûdgƶÜ»´Ûjɘűiyjû»ÜɘÛ»Ɣ3dg´jɕɘi´ÛÛ»ɛ9Ûûdɛ Ü3Û£ɘɐɛyÛjdûd ´ɕg Û»ÜɘÜ» d ÜɘÜ»ɔdÜ ɛyûdgƶ´jɕg ɘÛ»Ɣ3d (waist-to-hip ratio, WHR), ´ɕg ü9Üí¢jɕ´ɕ9ÛûÛÛ»Ü3ɘÛ»Ɣ£ÛûÜûÛ»Ɣ3Ûjûgƶɘ»ɔg3ÜœÛgƶ. WHR>1.0 ûÛ£ggƶƔ3Ûjûgƶɘ»Ü WHR>0.8 ûÛ£gƶɔg3ÜœÛgƶ Û»ɘ»Ü3ûɘ»ɘÛœɘɦ´ÜɕgûÜjɘdÜgƶɘÜ Ůɕɛyɜ3ɤgƶÜgɜ3dɛy3ɕg ɘɘüi3ɕg ɔ9Ü3ɕûɐɛÛÛÛ´ɕg ûɕÛÛ£ɕ3ÛÛ»ɛÛÛ[3´ÜɕgûÜjɘdÜ. B9´Ûjɘűiyjû»ÜûgƶɛÛÛjı3ÛÛ»ɛÛÛ»Ü3ÛûÜ£ɐɛ ɛÛ£ɕi jÜ. ÆgɕG3Ɣ´gƵjɕÛ»´jɦ6ɘdɛÜûÛ£ɕ3 Û3Û£´9ûɛɦ Û£g ûdɛÛ£ɕg´ɕg´jɣ´Û»3Ü ɔœÛ»d ɛyÛjdûd Û[dg´Ûjɘűiyjû»Üûgƶɛyûdgƶ, Ü»ɘƔ Ügűɦ ɘi3ÛÛÛ» ɛÛÛjı3ÛÛgƶ Û[3 ûÛÛ3ɦÛÛjd´Ûjɘɕgɛ. Æg3ɐdɣgƶ ûgɛ´ɑÛÛ»d´Ûjɘɕgɛ´ɕg ɛÛÛjƔÛÛ»3Ü´Ûj3Ɣ ûÜ3 ɛ9Ü3ɕdÛɛ ɔjÜɛɛɐ Ü ɦ Û£ɕ3 Üű Ü»ɦ Û£g Û£Û»ɕ3Û£. ¢´Ûjɘűiyjû»ÜɘÛ»Ɣ3dgƶ ɛÛÛjƔÛÛ»ûÛ[3 ɛÛ»Ü»iÛÛjd´Ûjɘɕgɛ ɛÛÛÛ»i ɛyûdgƶɘÜ»ɔg3ƔÛɤ3 (ûÛ£ ÛɑÛûɕ Ûɤ3 ɔ»ɕgÛı3). ¢´Ûjɘűiyjû»ÜɛyûɕgÜjɘûÛjɕi ɓjÜGœ3Ü(mid-upper arm circumference, MAC) ɛÛÛjƔÛÛ»ûÛ[ɛɘûɐÜ ɦûÛÛÛûd ɛÛÛÛ»i Ü»jɤɛœg ɕûÛ£i Û[dgɤɛɕ´ɘƔÛ[dgƶÜ»Û[3 ÛûɤÛÛjɘɐ ɘɕjgűɐ Û£g Ü»ɘı3Ü. B9 ɛÛÛjɐûÛ»gƶÛɤ3´Ûjɘűi Ûjûı3 ÜgÛı3 y»ɘ»Ü3 ɛÛÛ[3 GjɐûdÜ ɘɐgƶÛ»ÜûGÛ»ɐgƶɛÛÛjɕÛÛ»ɘdÜgƶ.

- **ƶ ɣÛjdûd ügÛjɛÜÛ£´ÛgGı3:**

qɘÜűɕjɣgƶ ûÛ£ ɛɣ»ÛûɕgƶÛ£g ûɐÛ»ÛÛ£i ɘÜ»Û[3 Ü3Ü»ɕ»dÜ Ɣ»ɘ´dgƶ ɛƔ£Ügƶûı ɛÜÛ£gƶɕüdɔɕi3 ûÛ üɘÜ»gɛƔ3ûÛ»gƶɛÛÛÛ»i ÜÛɦɛɤ3 Û£g cüɘgi ɣɕggƶ. ügÜ´Ûj Ɣüû»ɛÜ, ɕ9ɛgı ügƶgÜûdɘdÛ»gƶɛ´ɕjɕi3 3Ü GÛjÜ»Û[jɘûÛ£i3 g´ɣɣbÛjɕ9 ɘɦɔɤ Û[dgƶ Ügɜdɛy3dgƶ ɛguɐgƶ ɛƔ£ÜgƶÜ3Û[ɔ9Ü ɘɘ´ı üd ɘûÛɦ. B9 üÛjɛÜÛ£´ÛgGɣgƶûɘÜ»ɛ9Üɛydɕüɕgƶg´ɕɘɔɕûɛɕi ɘÜ»Ü3ɘɦɔdûdgƶÛ£g ´ɕûɕûÛ£i ɘɘ´ı üɕggƶɛƔ£ÜgƶûÛ£ ûı ɛÜ. Æɑ»Ü» ´jÜ»Û[»ɐ ɛydɕüɕgƶ, ɔsô ÜgÛɦ ɘjɑ»ÛÛÛ»ɤgƶ ɘÜÛƔɘɘdɘd ɛydɕüɕgƶ ɔ9Ü ɘɘ»ɘ3ɘɐygƶ ɛÛÛjɐûÛ»gƶ, Û Ü»ɘüɐ ɛ´ɕjûɑ3ÜÛɦÛjɛɕûÛÛɑÛɛÛ»ƔdÜ ûgɘɕɑdÜɘÜ»ɑÛ£dɘɦ ɘɦûÛ£ɕgƶ. ¢ Ü»jɑbÛ9ÜÛɦgƶ ɛydɕüɕgƶ ügÜ´Ûj Ɣüû»ɛÜ, ɕ9ɛgı ügƶgÜûdɘdÛ»gƶɛÛÛjɐûÛ»gƶ, Û Ü»ɘƔ Ügƶ ügÜ»ɦÛÛjdÛÛ£ɕ Ü ɦ Û£gƶ ügÜ»ɦÛÛjdÛÛ£ɕ Û»ÛÛÛûÛɐ. ȳÛÛ3 ɕ Û»ÛÛÛûÛɐgƶ ügÜ» ÛɑÛ»Ü»´Ü»ügɛy3ɕgƶ, dÜɘƔ3Û»ûdɛÜ»ɦ ûűƔɘɛÜɘÜÛƔÛ[3 ɛydÜ[d, Û£ɕ ɕ´ɕɑɛ dÜɕüdɔɐûÛ»ûÛ

ůı ɛŬŰɛɡ Űɛg ŮűŮɔɛɜŰɛ. Bɵ ŭŮɟɛŬŰɛ´Űĝɕɣɡ ´ɛg ɣɕɛgɜ ɜ əŬɔɨ ŰŮɟŬ Ű€ɭɜ ´ɟŬɔɛŬŰĝɔɐ ůɨůŰŮůɖ ůı ɛŬŰɛɡ ŮɔŭŬɔ ɛɵ Ůɟɵɔŭíŷɔɛg (triceps), ŭɔɔŭíŷɔɛg (biceps), ɤɛɛ´əŬŰĝŭŬŭ (subscapular skinfold) əŬɔg´Ůɟə Ŭɔɦɜɵŭ´Űĝɕɐ (waist skinfold). ¢ ŭŮɟɛŬŰɛ´Űĝɕɐ Ůɟɵɔŭíŷɔɛg əŬɔ ɖ g´ɵɤɛɛ´əŬŰĝŭŬŭ ŮɔŭŬɔ ŬgŰɣɡ´ɵg gɟɖůɔɛɛ´ɵɔɔɨɜŰŰɔ ŬɔɦɟŬ´ɔɛ ůgɕɜŶəɦɔɤ Ű€ɭɡ´əɖɟɦŰ€ɭŰŰɡ Ű€ɤɜ ɛŮűɦŭɤɜ Ŭɜɔɛəɦɔɖůɐɛɡ Ű€ɛggɡ. Bɵ ŭŮɟɛŬŰɛ´Űĝɕɣɡ Ůɟɵɔŭíŷɔɛg əŬɔ ŭɵɔŭíŷɔɛg ɛŮŰɟı ɜŰŰɔ ɤɡ Ůɔɐɡ: ɛŮɛŮɛɔɨɟŬ ɛŮŰɟŶŰŰɔ əŶɖŮŰŰ ůŰɛ´ɑůɤ ɛɣɟɵɡ Ű€g ɓɟŬɕɵɜŰ ɖ ŰɦůŰŰůɖ ɛŮŰŰɔɨ Ű€g əŬŰí ŰŰɟɵg ɵɟɵɵg Ű€g Ŭɔɟɤɛɵɵg ɵůŰɛɨ əŬɔ Ű€g ɤəŶəɟŬɔɵg (ŮůɤŰŰɟɵɐɛɡɐɟgűɐɡ Ű€g Ŭɔəı ɜŰ), Ůɔı Ű€ ɣɟɵůɕɖɛŬŰɛŭůɔɵɛɟɖɐ ɔɤɜɖŰ. ɀ ŮŶɜŬůŰĝəɦ ůɖɛŮɔı ɜŰŰŰɔŰ€ ůɖɛŮɔɛ ŬgŰɦ əŬɔůŰɖ ůgɜɣɕŮɔŬ ɵ ŮɔŮŰŰůŰɐɡŰɔŰůɖəı ɜŮɔŰ€ ŭɣɟɛŬ əŬŰÝ 1 Ůɔ. Ŷɜɤ Ű€g ɛɣůɵg əŬɔəɟŰŰÝɛŮŰ€ ɣɜŰɕɣɟɵ Ű€g Ű€ɭɜ ŭŮɟɛŬŰɛ´Űĝɕɐ əŬɔ ɛŮ Ű€ Ŷəəɵ ɕɣɟɵ Ű€ ŭŮɟɛŬŰɛ´ŰĝɕɦɛŮɟɵ, ɵ´ɦŰŰ əŶɜŮɔ Ű€ɭɜ ɛɣŰɟɖůɖ ´ɟɵůɣɕɵɜŰŰɡɜŰ´ŮɟəəŭɛɓŶɜŮŰŰɔɦəɖ ɖ ŭŮɟɛŬŰɛ´Űĝɕɐ ŬűıɐɜɵɜŰŰɡŰ ôɣɜɤ Ű€ɜ ɛgɯɒɦ ɜůŰɦ, Ůɜı Ű€ ɕɣɟɵ Ŭűıɐɜ ŮŰŰɔ Ůɔ·ıdŮɟɵ ɜŰ´ɣůŮɔ ɸɵ ŭɣɟɛŬ Ŭ ɵɛɵɜı ɜŮŰŰɔ Ŭ ɦ Ű€ɜ g´ɵəŮɛŮɔɵ ɛg əŬɔ ůŮ ɕɟɵəɔɦ ŭəŶůŰɖɛŬ 2 sec ´ɟɣ´Ůɔ ɜŰɔɵŮɔŬɜŶɔɜɤůɖ Ű€ɖgɣɜŭŮɔɓɖdgŰ€g ɵɟɔŶɜɵg. ŭəŬ Ůɔ·ɒŮŮŬɤůɖ Ű€ɖg Ůɔ·ɵŭĝıgɛɣŮɟɖůɖɖg, ɛ´ɵɟŮɒɵ Ůɔ·ŮŰŰůŰɐɡɜŰɟɤŰɐůɔ Ű€ɜ ŮɒŮɔɵɜŰɐ Ŭɜ ´ɵɜŶ, ɔŮɔɵɔɦɡ´ɵg ůɖɛŬɵŮɔɦŮɔůŰɛ ŭŮɟɛŬŰɛ´ŰĝɕɦɛŮɟɵ ůgɛ´Ůɟəə·ŬɛɒŶɜŮŰŰɔɛgəɔɦɡɡůŰɦɡ. Bɵ ŮɒŮɔɵɔɜŰɐɡŭŮɜ ´ɟɣ´Ůɔ ɜŮ´ɵɜŶɜŮ əŶɜŮɔ Ű€ɭɜ ɛɣŰɟɖůɖ əɟɣŰŰí ɜŰŰɡ´ŶɜŰŰ ɛŮ Ű€ɜ ɣɜŰ ɕɣɟɵ Ű€g Ű€ɭɜ ŭŮɟɛŬŰɛ´Űĝɕɐ əŬɔ ɜŮ ɛɖɜ Ŭűıɐɜŭɔ ´ɵŰɣ ɛɦɜɵ Ű€ ŭŮɟɛŬŰɛ´ŰĝɕɦɛŮɟɵ ůŰɛ ɕɣɟɵ Ű€g ŮɒŮɔɵɔɜŰɐ. ɀ Ů ŬɜŶəɵɔɵ Ůɟɦ´ɵ ɔɵŮŰŰɔ ɖ ɛɣŰɟɖůɖ Ű€ɖg ŭŮɟɛŬŰɛ´ŰĝɕɐɡŭɔəŮɛŶɜŮŰŰɔɵg. ¢ ɤɛɛ´əŬŰĝŭŬŭŭŮɟɛŬŰɛ´Űĝɕɐ ɛŮŰɟŶŰŰɔŭıɵ Ůə·ŬŰɛůŰŶəŶŰɤ Ŭ ɦ Ű€ɜ ɣůɤ ɔɤɜɖŰ Ű€g ɵůŰɛɨ Ű€ɖgɤɛɛ´əŶŰ€ɖgůŰɛəŶŰɤ ŭŮɟɛŬŰɛ´ŰĝɕɐɡŭɔəŮɛŶɜŮŰŰɔɵg. ¢ ɤɛɛ´əŬŰĝŭŬŭŭŮɟɛŬŰɛ´Űĝɕɐ ɛŮŰɟŶŰŰɔŭıɵ Ůə·ŬŰɛůŰŶəŶŰɤ Ŭ ɦ Ű€ɜ ɣůɤ ɔɤɜɖŰ Ű€g ɵůŰɛɨ Ű€ɖgɤɛɛ´əŶŰ€ɖgůŰɛ ɛ°/əŬɔ əŶɖŮŰŰɛ Ů ɖ ŮŰɵɐ), Ůɜı ɖ g´ŮɟəŬɔɦɜɵɜɡ´Ű€ɕɐ ɛŮŰɟŶŰŰɔɛŮŬ ɛɦɜɵɜɤůɖ ɛɜŬɡŭɔəı ɜɵŬɡ´Ű€ɕɐɡəŬɔ ůıɛűɤɜŰɛŮɛŮŰ€ɜ űɛɟŶŰɛg ŭɣɟɛŬŰɛɡ, ůŰɛ ɕı ɟɵɛ ɛɦəɡŶɜɤ Ű€ɖgəŬɔɦɜɵŬɡŭɔəůŰ€ɖůŰ€ ɔɟŬɛɛɐ Ű€g ɛɣůɵg ŶɜɵɜŰ (əŬɔ ´Ŷəɵ ůŮɛɜŰ ɜɵɖŰ€ ŭəŬı ɜɵŰ ɔɟŬɛɛɐ). ¢ɛ ŭŮɟɛŬŰɛ´ŰĝɕɦɛŮɟɵ ´ɵg ɟɵůɣɕɵɜŰŰɡɜŰ´Ůɟəəŭɛɓ€ɭŰŰɡ Lafayette skinfold caliper. Bɵ ɛŮɟɐůŮɡɣɔɜŰɔ ůŰ€ɖ ŭŮɔəŶ´əŮɡɟŶŰ€g ůı ɛŮŰɛɡ (ŭŮɔəɦɡɡ ɓɟŬɕɵɜŰŰɡ). ÆɵɜŰɔ əŬɔɦ ɵ ŮɔŮŰŰůŰɐɡ ɜŰ´ŬɡɟɜŰɔ ŮɟŮůɡ ɛŮŰɟɐůŮɡ əŬɔ ɜŰ g´ɵəɔɵɜŰŰɔ ɵ ɛɣůɵg ɦɟɵɡ. ÆŰ€ɖ ɛŮɔəŶŰ€ɖ ɦəŮɡ ɵɵ ɛŮŰɟɐůŮɡ ɣɔɜŰɔ ůŮ ɦɟɵɖŰ dɣůɖ əŬɔ ŮŰɔŬɔəŭɛűɖdəŬɔ ůŮəŶɖŮ´ŮɟɖŰɟůɖ ɛŮŰůŮɔɦɜɵɜɡ Ű ɦəəůɖ ɛŮŰŰɔɨ Ű€ggɡɣɤɡ 1 mm (ŮɟŮůɡ ůgɜɵəɔɜŶ Ű€ɛɣɡ ɔɔŰ əŶɖŮ ŭŮɟɛŬŰɛ´Űĝɕɐ, Ű ɦ Ű€ɡ ɵ´ɵdŮɡ dŰ g´ɵəɔɔůŰŰɒ ɛɣůɵg ɦɟɵɖ). ɀ ɔŰ ɛɣŰɟɖůɖ ŮɔŭŬɔɣɔəɡɟɖ ɦŰŰɔ Ű€ ŭŮɟɛŬŰɛ´ŰĝɕɦɛŮɟɵ ŭŮɖɜɔŮɔɛŰůŰɖŮɟɐ ɣɔŭŮɔɵɖ.

❖ **ɟ´ɵɟɟɵűdůɔɵɛŮŰɟdŰŬɔŰɔɤɜɔɟ ŭɔ´əɵdŮɔɣɟɔůŰɡ(D-XA):**

¢ ɵůŰɔɐ´gəɜɦŰŰŰŰ€g ůı ɛŬŰɛɡŰɤɜ ŮɒŮɔɵɜŰí ɜ əŬɔ ɖ ůɨůŰŮůɖ €g ɵəɔɵɨ ůı ɛŬŰɛɡŮgŰí ɜ ɛŮŰɟɐɖɖəŬɔ ɛŮŰɖ ɛɣɖɵŭŰ€ɖ ŮɟɖɡŰɟůɔɵɛŮŰɟdŰɡŬɔŰɔɤɜɔɟ ŭɔ´əɵdŮɔɣɟɔůŰɡ (Dual X-Ray Absorptiometry: D-XA; ÆgůəŮɐɐ Lunar DPX-MD, Madison, USA). Ɓɟɡɔɔ Ű ɦ Ű€ɖ ŭɵɔŭŮɔŭɜɦɜɵɜɡ ɛŮŰɟɐůŮɡ ɜŰɔŭŮɔɵɖəŮɡɟɖɛŮɟɐůŮɡ ůŰɛ ɛŮŰɟɐůŮɡ ɜŰɔŭŮɔɵɖ ɓŰdɛɜɦɟdůɖ Ű€ɖgůgůəŮɐɐgɛŮŰɖ

(Phantom). Bə ɛÜĴɐůŮĝf ɔɑɑɛɜÜÜɜ Ü ɦ Ůə´ÜəüÜĝɛɐɣɜɛ ɟɑɛg «ɑpəÜĴɛűɐɡf əÜə ʐ ÜÜÜbɛɐɔəůɛɛi» Ůɛg j ÜĴɛəɛ´Ůɛg

❖ **dɒɛɑdɛəɒɣɑfÜɜÜəi ůŮĝf**

ʐ ÜÜŸÜ ɦ 12ɤɟd ɜdůÜÜůÜ əÜə ɜɤɟɑfÜɛ ´ɟɤɑ (8:30-10:00 ´.ɛ.) ŮəɐűɑdůÜɜ üÜɒɛÜÜÜ űəŮəɒɛi ÜœÜÜɛfÜ ɦ ŮɛggfůɑůəɛɜÜɣfɔəÜɜÜɔɑɛgɜ ɛəÜ ÜəÜɛi ɛÜəŮfbɛɑdɛəɒɣfÜɜÜəi ůŮĝf. Aə´ÜəüÜĝɛɐɣɜɛ ´ɟɛůɤ´ɒɦ ´ɟÜɒɛÜÜɛ´ɛdůÜűəŮəɛəÜəÜűůŮĝfɔəÜÜd ůgəəɛɔɐ ůgɜɛəɒəŸ 25 mL ÜœÜÜɛfɑ. ¢ɛ ÜœÜÜɛ´ɛdÜÜűdůəŮůŮůɤəd3ŸĴəÜɑɤɟɑfÜəÜÜɛ´dəÜəɦ əÜə üəÜÜdĴɐdůəŮůŮdÜĴɛəəɟÜüdÜüɤɛÜÜœg ɔəÜ ´ÜĴɑɛg üi¢ ɪ ɟŮĝf, ɦ´ɛg ÜűɤydůəŮɜÜ´ɐɜŮə, əÜdɪ g´ɟɛɛɟəɛɦÜÜɜ ɔəÜüəÜɑɤɟəůɛɦ əÜə´ÜĴÜəÜbɐ ɛɟɛi. üəÜ Üɛ üəÜɑɤɟəůɛɦ Üɛg ɛɟɛi Ü ɦ ÜÜ ɣɛɛɛɟűÜ ůÜɛɛɑŮdÜ Üɛg ÜœÜÜɛfÜ Üəɛəɛidůd Ű gɔəɛəɣɜÜĴdůd Üɤɜ üÜəɒɛŸÜɤɜ ůŮĝf 3000 ůÜĴɛűɣgfəŮÜɦ ɔəÜ 15 əŮÜŸ. ¢ ´ÜĴÜůəŮĝɐ əÜə Ü ɛdɐəŮĝůd Üɤɜ üÜəɒɛŸÜɤɜ ɛɟɛi əÜdɪ g əÜə ɛəɓɛɑdɛəɒɣfÜəÜəi ůŮĝf ɣɔɛɑÜ ůÜɛ «Aɟɔ ÜŮůÜɐɟɛɛ qpəÜĴɛűɐɡf əÜə ʐ ÜÜÜbɛɐɔəůɛɛi» Üɛg j ÜĴɛəɛ´Ůɛg Ÿ ÜəŮ əůÜdɛɑg. ŸɟɛůüɛɟůdÜdəÜə ɛə Üɛɛɣfɔəɐɦɛdfg, ɢɛədůÜĴɦədfg, Ű ĴɛəəgəĴəůɛɔɤɜ, HDL (High Density Lipoprotein), LDL (Low Density Lipoprotein), ůəüɐɟɛg, űÜĴɟəÜbɑdfgəÜəɛəůɛgəɔɑdfgɛɟɛi.

❖ **ÆÜÜÜəůÜəɒɐ ŮəŸəgůd:**

¢ ůÜÜÜəůÜəɒɐ ŮəŸəgůd Üɤɜ üÜűɛɛɣəɤɜ ɣɔɛəŮ gɟdůəɛɛ´ɛəɪ əÜÜfg Üɛ ůÜÜÜəůÜəɒɦ ´ɟɦɔɟŮɛɛÜ Statistical Package for the Social Sciences (SPSS) software, Version 13,0 for Windows. ÆÜd3 ´ÜĴəɔɟŮűəɒɐ ůÜÜÜəůÜəɒɐ, ɛəůgəŮɛŮfgɛÜÜÜbəɑdÜɣfgŮəűɟŸůdÜəŮəɤfgɛɐůd Üɛɛɐ ± Ůg´əɒɐ Ü ɦəəəůɑd (mean ± SD). ɟɟgəəŸ ɣɔəəŮɣəəŮbɛɛgf əŮəɛəəɒɦůdÜÜfg Üɤɜ ´ɛůɛÜəəɪɜ gÜĴŮəÜdĴɟəůÜəəɪɜ Ü ɦ ÜÜ ɛ´ɛdÜ ŮəŸɔŮɛŮ ÜÜ Ü ɛÜŮəɣůɛÜÜÜ. Bə Üɛɛɣfɔəůɛɛɑɑdfg əÜə űÜĴɟəÜbɑdfg üŮə ŮəɛəəgdɛiůŮə əÜəɛɜəɒɐ əÜÜÜəɛɛɐ ůÜÜ üŮűɛɛɣəɜÜdfg´ÜĴɛiůÜfgɣĴůgɜÜfg. Ō Üůə, d üəÜĴŮiɜdůd Üdfg ůÜÜÜəůÜəɒɐgf ůgůɛɣÜəůdfg üi¢ ´ɛůɛÜəəɪɜ gÜĴŮəÜdĴɟəůÜəəɪɜ (üŮűɛɛɣəɛg ɦÜə d ɛdÜ Ůə Üɤɜ üi¢ ɐÜÜɜ d Üɛɛɐ ɛəůgəɔɑdfgɐ űÜĴɟəÜbɑdfg) ɣɔəəŮɛŮdÜdfg ɛd´ÜĴŮɛÜÜĴəɒfgɛÜűɛəüɛəɔɔdÜfg. Bɛd´ÜĴŮɛÜÜĴəɒɦgf ůgɜÜÜəůÜűɛfg ůgůɛɣÜəůdfg ůÜəɟŸfg Üɛg Spearman ´ÜgɟɜÜə Üɛɛɣfg Ü ɦ -1 ɛɣɛɟə +1. ɟɟɜdÜəɒɣfg Üɛɛɣfg üdəɪɜɛgɜ ÜĴɜdÜəɒɐ ůgůɛɣÜəůd, dÜÜəɒɣfg Üɛɛɣfg üdəɪɜɛgɜ dÜÜəɒɐ ůgůɛɣÜəůd əÜə d Üɛɛɐ ɛdüɣɜ üdəɪɜÜə Ü ɛgůdÜ ůgůɛɣÜəůdfg Üɤɜ üi¢ ɛÜÜÜbədÜɜ. Bə ůgɜÜÜəůÜűɛfg ůgůɛɣÜəůdfg Ü ɛÜÜəÜů, Ü ɛɛɣɜɤg, ɛɣÜĴɛ Üɛg bÜdɛɛi Üdfg ůgůɛɣÜəůdfg (üdəÜüɐ Üdfg ůÜÜɜɦÜdÜÜfg ɐ Üdfg ɣɜÜÜůdfg Üdfg ůgůɛɣÜəůdfg) Üɤɜ ÜəŸůÜɛÜÜ üi¢ ɛÜÜÜbədÜɜ ´ɛg ÜəÜÜŸɛɛɜÜÜəɑ Á´ůdfg, ɛə Üɛɛɣfg üəÜəÜdÜəɒɐfg ´ɟɦůədɣdfg Üůbůůűɛg üÜə əÜÜÜəɣɛɛɜÜÜə əÜəɛɜəɒŸ, Ü ɛɛɣɜɤgfɔəÜdÜ ůgůɛɣÜəůɐ Üɛggf ɛÜÜɛggf üəŸűɛɟɛggfüÜəɒÜÜfgɛůÜəɒɐgf´gəɜɦÜdÜÜfgÜűÜĴɛɦůdÜəÜəÜə´Ÿəəd ɛd´ÜĴŮɛÜÜĴəɒɐ ɛÜdɛüɛəɔɔdÜ. ¢ɛ Ü ɑ Üűɛ ůÜÜÜəůÜəɒɐgfůdɛÜəÜəɦÜdÜÜfgůÜɦəÜůfgÜəfgÜəÜəi ůŮəfɐÜÜə p<0,05.

´ɕəɕəəɐɟɤ ůŬɜ Ű€ ´ɟɤ Ű̃ɧəɕəəɕ Ű̃ɖɡɛŮəɐɣŰ̃ɖɡ, Ůə Ű€ɤɜ ɕ´ɕɑɤɜ ŮŰ̃ɡ əŮə ɕɘ Ů ŰŸ (7) Ɣɜ Ű̃ɟ Ůɡ (ŰɑœŮəŮɡ qɒ.1). ¢ ůŰŰ€ůŰ€ɑɐ ŮɜɎəgůɖ Ű€ɤɜ ůŰů̃ɕɛɣɜɤɜ ɓŮůɑůŰ̃ɭəŮůŰ€ ůŰŰ€ůŰ€ɑɧ ´ɟɧɔɟ Ů€ɛŮSPSS.

ŰɑœŮəŮɡqɒ1 ɟ ɜŮəgŰ€ɑɐ ´Ů̃ɔɟŮű̃ɐ Ű€g ůŮɒɛŮŰ€ɡ.

	Ɇgɜɕəəɔɧ ůŮɒɛŮ	ũgɜŮœŮɡ	ȯ ɜŭɟ Ůɡ
ɟ ɟ ɔɗɛɧɡŮŰ̃ɧɛɤɜ	41	34	7

qɒ1) ŰǺɅĦũɅɥ ū ĦŸ¢ Ŭɟ ɅBɟ Ɇɬ Ɇ¢ ɕq ʔ qɒǺqɒBz Ǻʔqʔ

qɒ1.1) ɟ ʔŪɅqŰBz ǺɕɅĦŸǺɆz ǺɕɅ¢ ɆǺĦɆɕBɟ qɒǺĦũz ɟɕBɆ

Ɇ€ɜ´œŮəŮ´ɕg Ůɔɕəɕgɗůɑ(ŰɑœŮəŮɡqɒ.2) ű̃Ůœɕɜ€ŮɔɕɔɛɣůɕɔɧɟɕɔəŮɔɕɔŰ́g´ɔɤɣɡŮ ɕəɔɑůŮɡɡ€g ůgɜɕəəɔɕi ůŮɒɛŮ€ɡ Ůɔə¥ əŮə Ű€ɤɜ ɔgɜŮɔɪ ɜ əŮə Ű€ɤɜ ŮɜŰ̃ɟɪ ɜ ɜŮɕɤɟɜůŰŸ ɔəŮ Ůɡ Ůəɧəɕgɗůɡ ɛŮ̃ɟɐůŮɡ: ɖəɔɑůŮ, ɓŸɟɕgɡ, ɨɣɕgɡ, qɒɀ Ɇ, ůŰ̃ɟɛŮ€´Ű̃gɕɣɡ (Ű̃ɟɔɑůŰ̃ɨŸəɕg, ůɔɑůŰ̃ɨŸəɕg, g´ɕɤɛɕ´əŮŰ́ɑůŮ, g´Ů̃ɟəŮɔɧɜɑŮ), ´Ů̃ɟɔű̃ɨɣɟŮɑŮ ɛɣůɖɖɡ əŮə əɧɔɕ ɛɣůɖɖɡ ´ɟɕgɡ ɔůɕœ (Waist-to-Hip Ratio, WHR).

ŰɑœŮəŮɡqɒ2 ɀ ɣůɕɔɧɟɕɔəŮɔŰ̃g´ɔɤɣɡŮ ɕəɔɑůŮɡɡŰ€ɜ Ůɜɖɟɤ´ɕɛŮ̃ɟɔɪ ɜ ɕŮɟŮɔŰ̃ɖɟɔůŰ€ɪ ɜ Ű€g ůgɜɕəəɔɕi ůŮɒɛŮ€ɡ, Ű€ɤɜ ɔgɜŮɔɪ ɜ əŮə Ű€ɤɜ ŮɜŰ̃ɟɪ ɜ.

ɀ ŰŰŮɔəɖŰ€	Ɇgɜɕəəɔɧ ůŮɒɛŮ (Mean ± SD)	ũgɜŮœŮɡ (Mean ± SD)	ȯ ɜŭɟ Ůɡ (Mean ± SD)
¢ əɔɑůŮ (ɣŰ̃ɖ)	19,75±3,08	19,52±3,07	20,85±3,07
dŸɟɕgɡ (kg)	62,39±11,23	60,77±10,41	70,25±12,53
ļ ɣɕgɡ (cm)	166,01±7,37	164,80±6,68	171,88±8,25
qɒɀ Ɇ (kg/m^2)	22,50±2,84	22,27±2,89	23,63±2,45
qŮɟɛŮŰ€´Ű̃gœ Ű̃ɟɔɑůŰ̃ɨŸəɕg (mm)	18,09±5,61	17,82±5,82	19,42±4,57
qŮɟɛŮŰ€´Ű̃gœ ůɔɑůŰ̃ɨŸəɕg (mm)	13,43±5,60	12,97±5,86	15,71±3,63

	,69	14,11±6,60	16,00±7,43
Ғ´ Ůғ əŮьҺҙэŮ ŭŮғ ЄŮЁ´ Ůgœ (mm)	18,04±7,34	17,00±7,05	23,14±6,98
ЧŮғ эúуgғ ŮэŮЄ уůdƍ (cm)	71,27±6,63	69,78±5,36	78,52±7,81
WHR	0,73±0,04	0,72±0,04	0,77±0,05

ф1.2) ɹ Ғz ɹ ¢ B ş ƀ ũ Ғ Ƭ B Ł Ƭ ɹ Ł d Ғ B j ¢ z Ғ Ƭ B Ł ф Ǽ Ғ Ƭ ¢ Ǽ Ғ

Ғ Ёɜ´œŮьŮ´ɵg Ůьɵəœgdůл(ЧœŮьŮƒф.3) ű Ůœɵ3ЁŮьɵɔɵɛуůɵɔҺjɹɵɔəŮьɵɔɵŮg´эɤуƒŮ ɵəəœůŮƒЁg ůgɜɵəэœɵі ŭŮœɛŮЁgƒ, Ůŕɜ ɔgɜŮьəı ɜ əŮь Ůŕɜ Ůьŭjı ɜ Ůŕɜ Ůьɤgƒ ŮьɛŮЁəɵɔэəı ɜ əŮь ƀьœɑdɛэəı ɜ ŭŮьəŮĺ ɜ: ůЧьɵGŮjɵ, ɵəədůŮЁjҺəd, Ůjэьəgəŭjɑŭэŭ, HDL, LDL, ůɑŭdɹɵɑƒ, ű Ůjɹэ Ůœd ɵɹɵі, эœůɵgəœd.

ЧœŮьŮƒф.3 z yůɵɔэҺjɹɵɔэəŮь Ůg´эɤуƒŮ ɵəəœůŮƒЁŕɜ ŮьɛŮЁəɵɔэəı ɜ əŮь ƀьœɑdɛэəı ɜ ŭŮьəŮĺ ɜ Ůɛg ůgɜɵəэœɵі ŭŮœɛŮЁgƒ, Ůŕɜ ɔgɜŮьəı ɜ əŮьŮŕɜ ŮьŮjı ɜ.

z ŮŰŮƀəd Ůe	ҒgɜɵəэəҺ ŭŮœɛŮ (Mean ± SD)	ũgɜŮœŮƒ (Mean ± SD)	ò ɜŭɹ Ůƒ (Mean ± SD)
ũəgəҺɛd (mg/dL)	95,34±7,88	94,26±7,71	100,57±6,97
j ɵədůŰjҺəd (mg/dL)	180,65±27,73	182,41±28,59	172,14±22,99
¢ɹэœəgəŮjɑŭэŭ (mg/dL)	78,41±33,65	80,38±36,35	68,85±12,45
HDL (mg/dL)	51,19±11,11	51,88±10,77	47,85±12,99
LDL (mg/dL)	113,78±22,26	114,45±23,78	110,51±13,34
Ғɑŭdɹɵƒ (ɛg/dL)	116,31±53,58	120,00±56,51	98,42±33,50
ū Ůjɹэ Ůœd ɵɹɵі (ng/mL)	22,27±18,57	18,75±13,40	39,40±29,97

	4,93±2,73	8,20±8,26

qp1.3) qÆ ¿ ÆBū ÆŤ qpÁqBz ÁŽ ¿ BJ qpÁÆñz ¿ BÆ

ÆÚ3 Ùhəcgd3 ´cÙÙ (ÙcÙÙfqp.4) ´ÙjcgůsŸc3ÚÙc9 ε yůc9 hjc9 əÙc9 Úg´səyf Ù cəəůůfg Ú3g ůg3cəəc¡ ůÙnεÚÚ3f, Úx 3 cg3Ùəı 3 əÙ Úx 3 Ù3ůj ı 3 c9Ù Ú3gf Ù3ef ůsÚj ε ű əc¡ f ůÙn Úfg: Ù3yj cÙsÙ, ´j x ÚÚ3d, gůÚÚŸ3dj Ùfg, əd ef (əəəh Ùəə Ÿ əÙ əcj ÙnεyzÙ, ε c3 ε Ùhjj ÙůÚÙ əÙ ´ əəgÙhjj ÙůÚÙ əə´ Ùj Ÿ), c3 əd ůÚÚj həd, ű gÚəyf œÙf (ůsÙəgÚyf əÙ ÙůsŸəgÚfg), ÙůbyůÚ3, ű x ůű hjj ef, ε Ùbzeůs, ůœdj ef, bsÚ3 œd D, bsÚ3 œd C əÙ əÙíÙ3d.

Ù œÙ Ùfq p4 z yůc9 hjc9 əÙ Úg´ səyf Ù cəəůÙfg Úx 3 ůsÙÚj cű əı 3 ůÙůc ε yzx 3 Ú3g ůg3cəəc¡ ůÙnεÚÚ3f, Úx 3 cg3Ùəı 3 əÙ Úx 3 Ù3ůj ı 3.

z ÙÚÚbəd Ú3	Ægzcəəəhj ůÙnεÙ (Mean ± SD)	ůgzÙœÙf (Mean ± SD)	ò zůj Ùf (Mean ± SD)
Ázyj cÙsÙ (kcal)	1854,76±615,32	1870,52±627,44	1778,19±592,09
Ù j x ÚÚ3d (g)	71,39±27,48	71,63±29,28	70,26±17,84
J ůÙÚŸ3dj Ùəfg (g)	211,01±76,92	213,47±79,92	199,05±64,18
Bəəhj əd ef (g)	82,51±31,58	83,49±31,10	77,75±36,02
Tecj ÙnεyzÙ əə´ Ùj Ÿ (g)	29,14±13,97	29,60±14,33	26,86±12,82
z ezcÙhjj ÙůÚÙ əə´ Ùj Ÿ (g)	35,85±16,16	36,50±16,10	32,72±17,35
Ù ecgÙhjj ÙůÚÙ əə´ Ùj Ÿ (g)	10,86±4,64	10,85±4,44	10,90±5,93
j ed ůÚÚj həd (mg)	219,55±96,73	222,82±99,69	203,65±85,81
ū gÚəyf œÙf (g)	16,15±12,48	16,78±13,47	13,11±5,15
qpÙgÚyf œÙf (g)	0,77±0,81	0,71±0,75	1,08±1,06

		4,41±6,24	2,84±2,74
	.19	1027,52±441,12	1009,91±367,05
ū ɤ ůűfɟɹ ɐɕƒ (mg)	1375,08±528,65	1398,27±554,72	1262,45±391,06
ɀ Ŭɔɜɐůɤɞ (mg)	253,11±139,98	259,05±150,49	224,26±69,96
Ɇɑŭɗɟ ɐɕƒ (mg)	11,45±5,81	11,64±6,24	10,54±3,22
ɗɞŰŰɛ ɶɓɖ D (IU)	69,97±69,51	63,50±46,37	101,38±137,84
ɗɞŰŰɛ ɶɓɖ C (mg)	109,25±101,04	109,35±106,03	108,76±78,87
Ƭ Ŭűí Ůɜɖ (mg)	67,71±139,03	69,69±150,68	58,11±62,12

ɷ1.4) ū ɟ ƉƐƬ¢ ɷɅɹ Ɇɸ¢ ɅHBɸ¢ ɸ ɻ

Ɇŭɛɜ ´ɶŬɔŬ ɷ5 ´ŬɟɐgůɘƔɛɐɜŰŰɔ ɐɘ ɛɣůɐɘ ɦɟɐɘ əŬɔ ɐɘ Ůƍ´ɘɔɣƒ Ŭ ɐəɔɷůŮƒ Ůɛg ůgɜɐəɔɘɕi ŭŮɒɛŬŭɛɠ, Ůɤɜ ɔgɜŬɔəɩ ɜ əŬɔ Ůɤɜ Ŭɜŭɟɩ ɜ ŬɜŰűɐɟɘɔƳ ɛŮ Ůɳɜ ŭɔƔɟəŮƔŬ əŬɔ Ůɳɜ ɣɜŰŰůɖ Ůɳƒ űgůɔəɐɠ ŭɟ ŰůŮɳɦɳŰɳŰŰƒ´ɐg ɣɠɐgɜ ůŮŮɒŭɐɛŰűɔŰŭƃƔůɖ (ɣɜŰŰůɖ A,B,C,D).

Ƕɷ Ŭɔ Ŭƒ ɷ5 ɀ ɣůɐɘ ɦɟɐɘ əŬɔ Ůƍ´ɘɔɣƒ Ŭ ɐəɔɷůŮƒ Ůɛg Ů ɘ´ɣŭɐg űgůɔəɐɠ ŭɟ ŰůŮɳɦɳŰɳŰŰƒ Ůɛg ůgɜɐəɔɘɕi ŭŮɒɛŬŭɛɠ, Ůɤɜ ɔgɜŬɔəɩ ɜ əŬɔ Ůɤɜ ŬɜŰɟɩ ɜ.

ŌɜŰŰůɖ ű gůɔəɐɠ ŭɟ ŰůŮɳɦɳŰɳŰŰƒ	**Ɖgɜɐəɔɘɦ ŭŮɒɛŬ (Mean ± SD)**	**ũgɜŬɔɷƒ (Mean ± SD)**	**ȯ ɜŭɟ Ůƒ (Mean ± SD)**
ɷɟ ŰůŮɳɦɳŰɳŰŰ ɣɜŰŰůɖƒɻ (min)	2578,29±249,17	2555±258,06	2691,42±172,08
ɷɟ ŰůŮɳɦɳŰɳŰŰ ɣɜŰŰůɖƒɗb (min)	246,39±207,02	272,41±212,07	120,00±126,09
ɷɟ ŰůŮɳɦɳŰɳŰŰ ɣɜŰŰůɖƒC (min)	24,75±106,75	15,73±85,67	68,57±181,42
ɷɟ ŰůŮɳɦɳŰɳŰŰ ɣɜŰŰůɖƒD (min)	32,30±144,92	39,37±159,55	0,00±0,00

ǨȆ

ɟɕɜ ŬɜŬǘɕɟɘŸ ɛŮŰɖ ůɕɎůɖ ´ɕɡ ɡ´Ÿɟɢŭ ŬɜŸɛŮŬŮŰɜ ...
´ɡɘɜŋŰɖŰ. Ǻ´ɕɛɎɜɤɡ, ɗŮɤɟɩ ůɘŋ´ɶɕ ɜŬ
´Ŭɟ ŬɗɎůɤ ŰŬŬ ɕŰɘɎůɛŬŬ Űɖɡ´Ŭɟɕɨ ůŬɡ ɤɟ Ůɡɜ Ŭɡ ůɕŰɘŸ ɛŮŬɡŰŋ Ű ɞɛŰɖɛŬ. ȾŰɡɡ´ ɶŬɘŮɡ
´ɕɡ Ŭɘɕɚɕɡɗɕɨ ɜ (ȾɶŬɘŮɡ ɸ.6 ɘŬ ɸ.7) ´Ůɟɕɡůɘ Ÿɛ Ŭ ɕ ŭŬɘŰɖɡ ůɡůɕɎůɗɡ (correlation coefficient) ɘŬ Ű Ů ɑ Ůɕ ůŰŰůŰɘɛɡ ůɖɛŬŰɘŋŰɖŰɡ (p-value) ŬɜŰɕɟɘŸ ɛŮ Űɖ ůɕɎůɖ ŭɘŬŰɖŰɘɛɡ´ɟŋůɘɖɣɖɡ ŬůɓŮŰɡ ɘŬŭŬŰ ɜ ɕůŰɘɛɡ´ɡɘɜŋŰɖŰɡɔŬ Ű ůɨɜɕɚɕ Űɡ ŭŮɛŬŰɡ (ȾɶŬɘŮɡ ɸ.6) ɘŬɔŬŰɡɔɡɜŬɘŮɡɘŬ Űɡɡ Ÿɜ Ů ɜŰɤɟůŸ (ȾɶŬɘŮɡ ɸ.7).

ȾɶŬɘŮɡ ɸ.6 ȾɡůɕɎůɖ Űɖɡ ŭɘŬŰɖŰɘɛɡ ´ɟŋůɘɖɣɖɡ ŬůɓŮŰɡ ɛŮ Űɡɡ ŭŮɛŰɡ ɕůŰɘɛɡ ´ɡɘɜŋŰɖŰɡɔŬ Ű ůɨɜɕɚɕ Űɡ ŭŮɛŬŰɡ.

ɸŮɘŰɡɕůŰɘɛɡ ´ɡɘɜŋŰɖŰɡ	Correlation Coefficient	p-value
T-score ɕɚɘŋ	0,040	0,803
T-score ´ɕŭɘ ɜ	0,060	0,710
T-score ů´ ɕɜŭɡɚɘɛɡ ůŰɐɚɖɡ	-0,131	0,416
Ȼ-score ɕɚɘŋ	-0,033	0,840
Ȼ-score ´ɕŭɘ ɜ	0,033	0,839
Ȼ-score ů´ ɕɜŭɡɚɘɛɡ ůŰɐɚɖɡ	-0,171	0,284
BMD ɕɚɘŋ (g/cm^2)	0,037	0,817
BMD ´ɕŭɘ ɜ (g/cm^2)	0,063	0,696
BMD ů´ ɕɜŭɡɚɘɛɡ ůŰɐɚɖɡ (g/cm^2)	-0,154	0,337

ůĺŭəɐƒ ´ɟɦůəʚdɣɤdƒ ŭůɓůůŭɶg ɛŮ ŭɶggƒ ŭůəɤŭŮƒ ɕůŭəɐƒ ɣɜŭɟ ůƒ.

	ũgɜŭəůƒ		ȯɜŭɟ ůƒ	
qůəɤŭŮƒɕůŭəɐƒ ´gəɜɦŰđŭŮƒ	**Correlation Coefficient**	**p-value**	**Correlation Coefficient**	**p-value**
T-score ɕəʚəɦ	0,072	0,686	-0,536	0,215
T-score ´ɕŭʚɯɜ	0,098	0,582	-0,649	0,115
T-score ůˊɕɜŭgəʚəɐƒ ůŰɐəʚdƒ	-0,092	0,605	-0,857	0,014*
Ȼ-score ɕəʚəɦ	-0,037	0,836	-0,321	0,482
Ȼ-score ´ɕŭʚɯɜ	0,038	0,831	-0,216	0,641
Ȼ-score ůˊɕɜŭgəʚəɐƒ ůŰɐəʚdƒ	-0,129	0,466	-0,564	0,187
BMD ɕəʚəɦ (g/cm^2)	0,062	0,729	-0,536	0,215
BMD ´ɕŭʚɯɜ (g/cm^2)	0,098	0,580	-0,571	0,180
BMD ůˊɕɜŭgəʚəɐƒ ůŰɐəʚdƒ(g/cm^2)	-0,117	0,509	-0,857	0,014*

* p<0.05

qɒ2.1) ƐJƐ¡ Ać€HƐ¢ €q ? ÆUHUÆqɒq ? Ɛ?ƐBJş Ɛ?¢Ɛ BΛBJ ɀ Æ€B J ƐqÆƐT€ÆƐ BƐ€ƐT¢Ɛ UJT?B€¢€ ¡Ɛ

ƐŰɕɜ ŮɦɛŮɜɕ ´œŭɔŭ (ʊœŭɔŭƒ qɒ.8) ´ŰɟɕgůəŸɕŮŰɔ ɕ ŭŮəɤŭđƒ ůgůɕɣŸŭůdƒ əŭɔ ŭɕ Ůđůɤŭɕ ůŰŰŭůŭəɐƒ ůdɛŭɔŭəɦŰđŭŮƒɔəŭ ŭɕ ůɨɜɕəɕ ŭɕg ŭŮəɛŭŰɕg. Bəɜ ŭŮəɤŭŮƒɕůŭəɐƒ´gəɜɦŰđŭŮƒŭɤɜɕ´ɕɑɤɜ ŭəŮɟŮgɜŸŰŭɔ ´əđŭɔɐ ůgůɕɣŸŭůdɛŮŰŭ ŮđůŭŭŮ əɯůɕgəʚɑdƒɕɟɕɨ Ůəɯŭɔɜɕəɔ Ůəɜɐƒɕ: T-score (ɕəʚəɦ, ´ɕŭʚɯɜ əŭɔ ůˊɕɜŭgəʚəɐƒ ůŰɐəʚdƒ), Z-score (ɕəʚəɦ, ´ɕŭʚɯɜ əŭɔ ůˊɕɜŭgəʚəɐƒ ůŰɐəʚdƒ), BMD (ɕəʚəɦ, ´ɕŭʚɯɜ əŭɔůˊɕɜŭgəʚəɐƒůŰɐəʚdƒ) əŭđɨ gəŭɔBMC (Bone Mineral Content, ŭŮəɤŭđƒ ŭđƒɕůŭəɐƒŮɜɛŮŰŸəəɤ ůdƒ).

ɜ ɔsůɛgəɔɑdʃgɛɻɛi ɛÙŰɛggʃŭÙəÙŰʃgɛůÙəɐgʃ´gəɜɧŰɖ[ŰŰʃɔɘŬ

qÙəÙʃgɛůÙəɐgʃ´gəɜɧŰɖ[ŰŰʃ	**Correlation Coefficient**	**p-value**
T-score ɛəɘəɧ	0,151	0,347
T-score ´ɛŭɘɹɜ	0,243	0,126
T-score ů´ɛɜŭgəɔəɐgʃůŰɐəɖʃgʃ	-0,036	0,823
Ć-score ɛəɘəɧ	0,122	0,449
Ć-score ´ɛŭɘɹɜ	0,350	0,025*
Ć-score ů´ɛɜŭgəɔəɐgʃůŰɐəɖʃgʃ	-0,105	0,512
BMD ɛəɘəɧ (g/cm^2)	0,149	0,352
BMD ´ɛŭɘɹɜ (g/cm^2)	0,258	0,104
BMD ů´ɛɜŭgəɔəɐgʃůŰɐəɖʃgʃ(g/cm^2)	-0,040	0,802
BMC (g)	0,137	0,392

* $p<0.05$

Æ[ŰɛɜŰ´œÙəŬqɒ9´ŰɻɛgůɘƳɛÙŰŰəɛŭÙəÙŰʃgůůɔɏÙŰůɖʃgʃ (correlation coefficient) əŬəÙŰɛÙɖÙůɛůŰŰŰůÙŰŰɐgʃůɖɛŬɜÙŰɐɧŰɖ[ŰŰʃ (p-value) ɔɘŬÙŰɐgʃɔgɜŬəÙŰʃəŬəÙŰɛggʃƳɜŭɻÙŰʃ´ɛg ÙɘŮŰŰƳůÙŰɖəŬɜ, ɧ´ɤgʃ´ɻɛɏəgɣŬɜŬŰɧÙŰɖʃůůɔɏÙŰůɖ[ŰɤɜÙɔ´ɏŭɤɜɘsůɛgəɔɑdʃgɛÙŰɛggʃŭÙəÙŰʃgɛůÙəɐgʃ´gəɜɧŰɖ[ŰŰʃ.

* p<0.05

<u>3.2) Mối liên quan giữa một số đặc điểm lâm sàng với mật độ xương</u>

Bảng 3.10 Tương quan giữa tuổi và mật độ xương ở nhóm bệnh nhân nghiên cứu

ÿüx ɜ űŮĵ ɟ ɜŮűɐdʃg ɐɟɐi ɛŮŰɛggʃ üŮɒŰŮʃg ɐůŰəɐg ´ gəɜɦŮűʃŰŰg

qŮɒŰŮg ɐůŰəɐg ´ gəɜɦŮűʃŰŰg	Correlation Coefficient	p-value
T-score ɐəɘəɦ	-0,066	0,680
T-score ´ ɐŭɔu ɜ	0,115	0,473
T-score ů´ ɐɜŭgəɘəɐg ůŰɛəʤʃg	-0,002	0,992
Ć-score ɐəɘəɦ	-0,276	0,081
Ć-score ´ ɐŭɔu ɜ	-0,069	0,668
Ć-score ů´ ɐɜŭgəɘəɐg ůŰɛəʤʃg	-0,211	0,185
BMD ɐəɘəɦ (g/cm^2)	-0,071	0,659
BMD ´ ɐŭɔu ɜ (g/cm^2)	0,119	0,458
BMD ů´ ɐɜŭgəɘəɐg ůŰɛəʤʃg(g/cm^2)	-0,002	0,988
BMC (g)	0,183	0,253

ɟ əɐəɘegdŮɒɐ ´ œŰəŰgʃqɔ11 ůŰɛɜ ɐ´ ɐɐœ űŰœŮŰŰəɐ üŮɒŰűʃgůgůɕɣŰɘůdʃgəŰəŰɛ Ůɑ Ůɒɐ ůŰŮŰɘůŰəɐg ůdɛŰɜŰɘəɦŮűʃŰŰg Ŭɦ ŰűĮ ůgůɕɣŰɘůd Ůɤɜ Ůɘ ɣüɤɜ űŮĵ ɟ ɘŮűɐdʃg ɐɟɐi ɛŮŰɛggʃ üŮɒŰŮʃg ɐůŰəɐg ´ gəɜɦŮűʃŰŰgɔɘŰŰgɔgɜŰɒŮʃəŰəŰɛggʃ Ɣ3ŰĵŮʃgɜŮɕɤɟɘůŰɣ.

	ũgɜŬœůƒ	ò ɜũɣ ůƒ		
qůœŰŰƒɕůŰəɐƒ ´gəɜɦŰɖŰŰƒ	Correlation Coefficient	p-value	Correlation Coefficient	p-value
T-score ɕəəɦ	-0,199	0,260	-0,500	0,253
T-score ´ɕŭɘɯ ɜ	-0,031	0,861	-0,216	0,641
T-score ů´ɕɜŭgəəɘɐƒ ůŰɐəɖƒ	-0,096	0,588	-0,107	0,819
Ȼ-score ɕəəɦ	-0,236	0,178	-0,786	0,036*
Ȼ-score ´ɕŭɘɯ ɜ	-0,124	0,486	-0,577	0,175
Ȼ-score ů´ɕɜŭgəəɘɐƒ ůŰɐəɖƒ	-0,147	0,407	-0,527	0,224
BMD ɕəəɦ (g/cm^2)	-0,209	0,236	-0,500	0,253
BMD ´ɕŭɘɯ ɜ (g/cm^2)	-0,022	0,900	-0,250	0,589
BMD ů´ɕɜŭgəəɘɐƒ ůŰɐəɖƒ(g/cm^2)	-0,096	0,590	-0,107	0,819
BMC (g)	0,044	0,807	0,107	0,819

* p<0.05

<u>qp2.3) ƐJƐj ÁɛHƐ¢ ɛq ? ÁUHUÁqq ? Ɓ?ƐBJ ş Ɓ?¢ Ɛ ƁΛBJ z Á ɛBJƐ qÁƑɛÁƐ ƐJƐɛ ȷ Ɛ¢ Ɛ Ɛq z ȷ ɛBƐ</u>

Ɛŭɕgƒ ´œŬɔůƒ qp.12 əŬɔ qp.13 ´ɕg Ŭɔɕəɕgɖɕi ɜ ´ŰȷɕgůəŸɛŮŰŬɔ ɕ ŭůœŰɖƒ ůgůɕɣŰəůɖƒ əŬɔ Ůɕ Ůɖ ůœɕ ůŰŰŬəůŭəɐƒ ůɖɛŬɔŭəɦŰɖŰŰƒ ɦ´ɤƒ ´ȷɕɣəgɣŬɔ Ű ɦ Ůɖ ůgůɕɣŰəůɖ Ůɤɜ Ůɘ´ɣŭɤɜ ɜsůɕgəɶɖƒ ɛŮŰɕgƒ ŭŮœŰŰƒ ůi ůŰŰůɖƒ ůı ɛŮŰɕgƒ, ůŰɕ ůi ɜɕəɕ Ůɕg ŭŮœɛŮŰɕgƒ (´œŬɔŮŰƒ qp.10) Ŭɔəɕ Ɣ əŬɔ ɜ ůɕɤȷ ɣəůŰŸ ůŰɕƒ ɔgɜŬœůƒ əŬɔ ůŰɕgƒ Ɣɜŭȷ ůƒ (´œŬɔŮŰƒ qp.11). Ɓɘ ŭŮœŰŰƒ ůi ůŰŰůɖƒ ůı ɛŮŰɕgƒ ´ɕg ůgůɕŮŰůɖəŬɔ ɛŮŰŰ Ůɖ ŮŭŬ ɜsůɕgəɶɖƒ ɕȷɛi ŮœŬɔɕɘŮɔɐƒ: qpχ Ɛ, WHR, SFR, ´ŰȷəűɣȷŮəŬ

ðı ɜ sůŰ ɜ (əɔ́ ı ŭd ə Ůə ɛ gцpɵi sůŰɨ), ´ ɵůɵůŰĵ əɑ́ ɵ gg ſ Ů ɑ
ɟ Ůɛ ɛ Ɣĵ ɜ Ů əɔ́ ı ŭɵgg ſ sůŰɨ, ɔɟ Ůɛ ɛ Ɣĵ ɜ Ů ɛ gцpɵi sůŰɨ əůə

Ŧ ɑɵůə Ůſ qp12 Ɇgůɔɣ Ůɨůd Úɤ ɜ Ů ɔ́ ɣŭɤ ɜ sɓůɵ gəɵdd ſ ɵɟ ɵi ɛ ůŰůɵ gſ ŭůəɒ ŰĴſ ůı i ůŰŭd ſ ůı ɛ ŰŰɛ gſ ɔɜŰ Ůɛ ůı ɜ ɵəɔ ɵ Ůɛ g ŭůəɒ ɛ ŰŰɛ gſ.

qůəɒ ŰĴſ ůı i ůŰŭd ſ ůı ɛ ŰŰɛ gſ	Correlation Coefficient	p-value
qɤ Ɇ (kg/m^2)	0,311	0,048*
WHR	0,270	0,088
SFR	-0,072	0,656
Ŧ Ůĵ ɔúɤɟ Ůə Ů ɛ yůd ſ (cm)	0,388	0,012*
% əɑ́ ɵ gg ſ Ů ɑŰɤ ɜ ɛ Ůə Ůə ı ɜ sůŰ ɜ	0,045	0,782
% əɑ́ ɵ gg ſ Ů ɑŰd ſ ůɤ ɛ ŰŰəɒ ɵ ſ ɛ Ɣɛ Ůſ	0,039	0,809
əɔ́ ı ŭd ſ sůŰĵ ſ (g)	0,100	0,536
ɛ gцpĥ ſ sůŰĵ ſ (g)	0,106	0,510
ɛ Ůə Ůə ɵɑsůŰɛɑ (g)	0,136	0,398

* p<0.05

Ŧ ɑɵůə Ůſ qp13 Ɇgůɔɣ Ůɨůd Úɤ ɜ Ů ɔ́ ɣŭɤ ɜ sɓůɵ gəɵdd ſ ɵɟ ɵi ɛ ůŰůɵ gſ ŭůəɒ ŰĴſ ůı i ůŰŭd ſ ůı ɛ ŰŰɛ gſ ɔɜŰ Ůɛ ſ ɔgɜŰəɒ Ůſ əŰə Ůɛ gg ſ Ɣɜŭɟ Ůſ.

	ũgɜŰəɒ Ůſ		ó ɜŭɟ Ůſ	
qůəɒ ŰĴſ ůı i ůŰŭd ſ ůı ɛ ŰŰɛ gſ	Correlation Coefficient	p-value	Correlation Coefficient	p-value
qɤ Ɇ (kg/m^2)	0,384	0,025*	-0,036	0,939
WHR	0,257	0,142	0,357	0,432

	4	0,678	-0,714	0,071
	4	0,025*	0,464	0,294
% əɑí ɐggƒŮ ɑŰɤ ɜ ɛŮəŮəı ɜ ɜůŰı ɜ	0,051	0,776	0,357	0,432
% əɑí ɐggƒŮ ɑŰdƒ ůɤ ɛŮŰəɐƒɛ¥ɛŮƒ	0,042	0,813	0,357	0,432
əɘ´ ı ŭdƒɜůŰhƒ(g)	0,078	0,661	0,143	0,760
ɛgɯphƒɜůŰhƒ(g)	0,015	0,933	-0,857	0,014*
ɛŮəŮəɐɑɜůŰɛɑ(g)	0,072	0,685	-0,607	0,148

* p<0.05

ɯ2.4) ƐJ Ɛj ÆɆ HƐ¢ Ɇqʔ ÆUHUÆqɯʔ ū ÆΛΛHɆƐ2¢ Ɛ ƁΛBJ ɀ Æ ɆBJ Ɛ ɯÆHƬɆ ÆƐ ƐJ ƐɆ ɻ Ɛ¢ Ɛ Ɛq ɀ ɻ ɆBƐ

ɻ əɐəɐegdɐɐi ɜ ɐɘ ´ œŮəŮƒ ɯ.14 əŮə ɯ.15 ɐɘ ɐ´ ɐœɘ ´ Ůɻ ɐgůɘ¥ɛgɜ Ůɛ ŭŮəŰɬ ůgůɕɣŰšůdƒ əŮə Ůɛ Ůɗ Ůŭɛ ůŰŮŰšůŰəɐƒ ůdɛŮəŰšəɦŰɬŰŮƒ ɦ´ɤ ƒ ´ɻɐɣəgɣŮə Ů ɦ Ůɬ ůgůɕɣŰšůd Ůɤ ɜ Ůɘ´ɣŭɤ ɜ ű Ůɻ ɻ ɘŰœdƒ ɛ ŮŰɛgƒ ŭŮəŰŮƒ ůi ůŰŮůdƒ ůı ɛŮŰɛgƒ ůŰɛ ůi ɜɐəɐ Ůɛg ŭŮəɛŮŰɛgƒ (´ œŮəŮƒ ɯ.12) Ůəəɣ əŮə ɜŮɕɤ ɻ ɘůŰɣ ůŰšƒ ɔgɜŮəŮƒ əŮə ůŰɛgƒ ¥ɜŭɻ Ůƒ (´ œŮəŮƒ ɯ.13). Ƀɘ ŭŮəŰŮƒ ůi ůŰŮůdƒ ůı ɛŮŰɛgƒ ´ɐg ůgůɕŮŰůdɖəŮɜ ɛŮŰŮ Ůɗ ŮŭŮ œšůɐgəœdƒ ɐɻɐi ŮəŮə ɐɘ ɑŭœɘ ɛŮŮgŮɛi ƒ ´ɐg ŮɜŮŰíɣɻdɖəŮɜ ůŰɬɜ ´ Ůɻ ¥ɔɻ ŮŰɐ ɯ.2.3.

ƬœŮəŮƒ ɯ.14 ƐgůɕɣŰšůd Ůɤ ɜ Ůɘ´ɣŭɤ ɜ ű Ůɻ ɻ ɘŰœdƒ ɐɻɐi ɛŮŰɛgƒ ŭŮəŰŮƒ ůi ůŰŮůdƒ ůı ɛŮŰɛgƒ ɔɘŮŰɛ ůi ɜɐəɐ Ůɛg ŭŮəɛŮŰɛgƒ.

qŮəŰŮƒ ůi ůŰŮůdƒ ůı ɛŮŰɛgƒ	**Correlation Coefficient**	**p-value**
qɣ Ɛ (kg/m^2)	0,365	0,019*
WHR	0,301	0,056
SFR	0,265	0,094
ƬŮɻ ɘúɣɻ ŮəŮɛɣůdƒ (cm)	0,413	0,007**

	-0,094	0,560
% ǽí ɐggƒŮ αŰđƒ ůɤ ɛŮŰǽɐɐƒɛŸɛŮƒ	-0,091	0,572
ǽǿ´ ı ŭđƒǿůŰĵƒ(g)	-0,008	0,962
ɛ gɯpĵƒǿůŰĵƒ(g)	0,195	0,223
ɛŮǽŮǽɐɑǿůŰɛɑ(g)	0,185	0,246

* p<0.05

** p<0.01

Ŧɑœŭǽŭƒɑp15 Ɇgůɕɣŭǽůđ Ůɤɜ Ůǿ´ɣŭɤɜ ű Ůĵɻǿŭœđƒɐɻɕi ɛŮŰɛgƒŭŮœŰĵƒůi ůŰŮůđƒůı ɛŮŰɛgƒɔgɜŭœůĵƒəŭǽŰɛgƒŸɜŭɻůĵƒ.

	ũgɜŭœůĵƒ		ȯɜŭɻůĵƒ	
qŮŮœŰĵƒůi ůŰŮůđƒ ůı ɛŮŰɛgƒ	Correlation Coefficient	p-value	Correlation Coefficient	p-value
qɤ Ɇ (kg/m^2)	0,262	0,135	0,750	0,052
WHR	0,043	0,809	0,643	0,119
SFR	0,375	0,029*	0,250	0,589
Ŧůĵǿúɤɻůəŭɛɣůđƒ(cm)	0,207	0,241	0,893	0,007**
% ǽí ɐggƒŮ αŰɤɜ ɛŭəŭı ɜ ǿůŰı ɜ	-0,018	0,920	0,036	0,939
% ǽí ɐggƒŮ αŰđƒ ůɤ ɛŮŰɛɐɐƒɛŸɛŮƒ	-0,013	0,941	0,036	0,939
ǽǿ´ ı ŭđƒǿůŰĵƒ(g)	-0,004	0,982	0,250	0,589
ɛ gɯpĵƒǿůŰĵƒ(g)	0,035	0,843	0,214	0,645
ɛŮǽŮǽɐɑǿůŰɛɑ(g)	0,041	0,819	0,321	0,482

** p<0.01

ǘƌ ε Ǜ϶ҿǗǚƌ ε ´ ϵɟ ϵɨ ɜ ɜ Ǔ ɢʏ ɟ ɐǘǗɨ ɜ ǘǙǜɨ ϵ ε ǙƄ϶ ǘƌ Ǜɧǘǚǘƌ. ... ǓǗǗ ´ ϵg ǛǓǗγɟ ϵɜǗǗ϶ ǘǚ ǘɢҿǘǚ ǘǚƌ ϶ǘϵgɘϭǚƌ ɘǛ϶ ǘǚƌ ǘǙɟ ɘǗǚƌ ε Ǚǘϵgƌ ǜǛǘǗƌ ϵǘǗ϶ ɐ ƌ ´ gɘɜǘǚǗǘ. ¢ ǜǙɨ Ǘǚɟ ƌ Ǜɧǘǚǘ ´ Ǚɟ϶Ǔ ε Ƅɜǘ ǚ ǘgǘɢҿǘǚ ǘ ɜ Ǚ ɘ́ ҿǜ ɜ ϶ǘϵgɘϭǚƌ ɘǛ϶ ǘǙɟ ɘǗǚƌ ε Ǚǘϵgƌ ǜǛǘǗƌ ǘɨ ǘǗǗǚƌ ǘɩ ε Ǘϵƌ ǘ ɜ ǗǗɧ ε ɣ ɜ ´ ϵg ǛǗǗǘǚɘǛ.

Ɐɜɧǘǚǘ 1[d]

ɟ ɜǓǘ ϵɟ ϶Ƴ ε ǘǚɜ ϵǘǗ϶ ɐ ´ gɘɜǘǚǗǘ Ƅɟҿǚǚɘǘɧǘ ϵ ǜǘǚǘƌ Z-score ǘƌ ´ Ǚɟ϶ɢɐ ƌ ǘ ɜ ´ ϵǜɩ ɜ, ɧ ´ ɣ ƌ ε Ǘɟ ɐǚɘǘ ε Ǘ ǘ ε ǚɢƳɜǚ ε Ǔ D-XA, ǘɢǘǗǗǚǘǗ϶ Ƴ ε ǗǗǘ Ǚ ά ǗǗ ϶ǘϵgɘϭǚƌ ǘǘ ǘɨ ɜϵɘϵ ǘg ǜǘǘ ε ǗǗƌ. ȼ ϵ Ǘɟ ǚ ε Ǔ Ǘgǘɧ ҿɟ ɢǘǗǗ϶ ǘǘǘgε ǘɣ ɜǚǓ ε ǙǗɟ ɘǗҿƌ ҿɟ Ǘɜ Ǘƌ. Ʉ϶ ǘgɔ ɘǘɟ ϶ ҿɜǓ, ǘǗǚɜ ǛǓǘɘɧ ´ ǚǘǚ ǘ ɜ Thrailkill et al[76] ɘǗǚɩ ƌ ɘǛ϶ ǘǙǓgǗ ǘ ɜ Hofbauer et al[154] g ´ ϵǘǗǚɟ ɢǘǗǗ϶ ɧǗ϶ ǚ ϶ǘϵgɘϭǚ ǘϭǛ ǛǓƄϵɘ϶ɧ ´ Ǚɟ Ƴϵɜ ǗǗƌ ǘǗǗ ϵǘǗƳ, Ǘgɜ Ƴɜϵɜ ǗǗƌ ǘǚɜ ϵǘǗ϶ ɐ ´ gɘɜǘǚǗǘ. Ƀ϶ ´ ɟϵǛǓǗǙ ǚǘǘǘƌ ǛǓǘɘϵ ´ ɐǘ϶ƌ, ɘǗǚɩ ƌ ɘǛ϶ ϵ϶ g ´ ɧɘϵ϶ ´ ǘƌ ҿɟ Ǘɜ Ǘƌ ´ ϵg g ´ Ƴɟ ɢϵgɜ ǘǘ ǘgɔ ɘǘɟ ϶ ҿɜϵ ǘ ε ҿǓ, ҿɢϵgɜ ƄǓǘ϶ǘǗǚ ǘǙ Ǔ ϵǗǗ϶ҿǘ ε ǓǗǗ Ǔ ɧ ε ǗǗɟ ɐǘǘƌ ´ ϵg ҿɢϵgɜ ɔϭǛ϶ ǘǙ ´ ɘǚƌgǘ ε ϵɨ ƌ ǗǘǚǙɩ ɜ ε Ǚ Ɇɸ ȼɨ ´ ϵg 1 ɘǛ϶ ȼɨ ´ ϵg 2. ȼ Ǔ Ǔ ϵǗǗ϶ҿǘ ε ǓǗǗ Ǔ ɧ ǗgǗҿƌ Ǘƌ ҿɟ Ǘɜ Ǘƌ ҿɢϵgɜ ǜǘǛ϶ ɧǗ϶ ϵ Ɇɸ ȼɨ ´ ϵg 1 ǘɢǘǗǚǘǗǗ϶ ε Ǘ ε Ǘɣ ε ҿɜǚ ϵǘǗ϶ ɐ ´ gɘɜǘǚǗǘ[81,82], ǘǓǗǛǗǚǘǚ ε ǘǗǚɜ Ɇɸ ȼɨ ´ ϵg 2, ǘǗɜ ϵ ´ ϵϭ ´ ǗɟǓǘǚɟ ǚǗǗ϶ ǘ ǛǗǚǘǗǘ ǘǛɧ ε Ǜϵ. ɟ ´ ɧ ǘ ɔǛϵɜɧƌ ǗgǗɧ ǛƳǚǗǗ϶ ǘ ǘgε ´ ҿɟ Ǘǘ ε Ǔ ɧǗ϶ ǚ ϶ǘϵgɘϭϵ ´ ǛɜǓ, ɘǛ϶ ɘǗǗ ǘ ҿɘǗǗǘǚ ǗǗ ɢǗεǚɘƳ Ǚ ά ǗǗ ϶ǘϵgɘϭǚƌ, ǘɢǘǗǗϵɜǗǗ϶ ε ǙǙ ϶ɘǛǘǘƌ ǘgɜҿ ǘǘƌ ɔǛ ǘǚ ǘɘǘǗǗɐ gɔǚǓ ɘǛ϶ ´ ϶ ǘgɔ ɘǘɟ ϶ ҿɜǓ ε Ǚ ɢǗε ǚɐ ϵǘǗ϶ ɐ ´ gɘɜǘǚǗǘ. Ɇǚ ǘgɜҿɢǘǓ, ´ Ǚɟ ǓǚǚǘǗǗ϶ ϵɟ ɐǘ ε ҿɜǘƌ Ǔ ɧ ǘƌ ҿɟ Ǘɜ Ǘƌ ´ ϵg ǘɐǘɢɨ ϵgɜ ǘǚɜ ´ Ǚɟ Ǔ Ƴɜɣ ´ ɟ ɧǗǗǘǚ.

Ƀ϶ Kemink et al[81] Ǚɟ Ǘɨ ɜǚǘǛ ǗɟƳɜǗǗ ´ ҿǗǘ(35) ε Ǘɐ ɘϭ ǘƌ ǗǘǚǗǘƌ ε Ǘ Ɇɸ ȼɨ ´ ϵg 1 ɘǛ϶ Ƅɟ ɐɘǛ϶ ɧǗ϶ ǘ ´ Ǜɐ ɜǗǗ Ǚ ǗƳ (57) % ǘ ɜ ɔgɜǛɩ ɜ ɘǛ϶ ǘ Ǜɐ ɜǗǗ Ǚ ǗƳ (67) % ǘ ɜ Ǜǜɟ ɩ ɜ ǘɢǛ ϵǘǗǘ ´ ǘǚǓ (T-scoreÒ-1 SD) ǘǗɜ ϵǘǗgɸɐ ε ϵɢ ǓǘƌǗ ´ ϵɜǜgɘϭɐƌ ǘǗɐǚƌ ɘǛ϶ ǘǗɜ Ǘgɢҿɜ Ǔ ǘg ε ǚɟ϶Ǘϵg ϵǘǗɨ ɘǛ϶ ǘ ǜǘǓǗǚǘǘǙǓ (14) % ǘ ɜ Ǜǜɟ ɩ ɜ ´ ɘǚɟ ϵɨ ǘǙ ǗǗ ɘɟ϶ǘɟ϶Ǔ ɔ϶Ǔ ϵǘǗǘ ´ ɧɟ ɣ ǘǚ (T-scoreÒ-2,5 SD). Ƀ ε ϵϭ ɣ ƌ, ϵ϶ Kayath et al[83] Ǚɟ Ǘɨ ɜǚǘǛ ǛǘǛɐ ɜǗǗ (90) ǜ϶Ǜǚǘǚϵɨ ƌ ǗǘǚǗǘƌ ȼɨ ´ ϵg 1 ɘǛ϶ Ƅɟ ɐɘǛ϶ ɧǗ϶ ǘ 34% ǗgǗ ɜ ǘɢǛ ϵǘǗǘ ´ ǘǚǓ (Z-scoreÒ-1 SD), Ǜɩ ϵ϶ Munoz-Torres et al[84] [ϵ϶ ´ ϵϭ϶ Ǚɟ Ǘɨ ɜǚǘǛ ǛǘǛɐ ɜǗǗ ǗҿǘǘǙɟ϶ƌ (94) ǗǘǚǗǘƌ ε Ǘ Ɇɸ ȼɨ ´ ϵg 1] ǛҿǘǙɟ Ǜ ɧǗ϶ ǘ ǜǛǓǗɜҿǓ (19) % ǗgǗ ɜ ´ ɘǚɟ ϵɨ ǘǙǗǗ ɘɟ϶ǘɟ϶Ǔ ǘg ɄBɟ ɔ϶Ǔ ϵǘǗǘ ´ ɧɟ ɣ ǘǚ.

ɟ ɟ ɘǗҿƌ ҿɟ Ǘɜ Ǘƌ ҿɢϵgɜ ɔϭǛ϶ ɘǛ϶ ǘǙ Ƴǘ ε Ǔ ε Ǚ Ɇɸ ȼɨ ´ ϵg 2. Ƀ϶ Dennison et al[92] ҿǜǛϭǛ gɣ ǚɘɧǗǙ ǚ ϵǘǗ϶ ɐ ´ gɘɜǘǚǗǘ ǘǙǜ϶Ƅǚǘ϶ϵɨ ƌ ȼɨ ´ ϵg 2 ǘǙǘɢҿǘǚ ε Ǚ ǗgɔɘgɘǛε϶Ƴ Ƴǘ ε Ǔ. ȼ Ǔ Ǔ ϵǗǗ϶ҿǘ ε ǓǗǗ ǗgǗƳ Ǜ϶ǘɢɨ ϵɜǗǗ϶ Ǔ ɧ ǗǗ Ǘɟ ɐ ε ǓǗǗ ǘ ɜ Barrett-Conner et al[93], Reid et al[94] ɘǗǚɩ ƌ ɘǛ϶ Strotmeyer et al[87], ϵ϶ ϵ ´ ϵϭ϶ Ƅɟ ɐɘǛ϶ gɣ ǚɘɧǗǙ ǘƌ ǘε ҿƌ ϵǘǗ϶ɐ ƌ ´ gɘɜǘǚǗǘƌ ǘǙϵɘɧɘǚɟ ϵ ǘ

[illegible] al[87]) [illegible] (Barrett-Conner et [illegible] 2.

[illegible] 1 [illegible] 2 [illegible] vs [illegible] IGF [illegible] vs [illegible] 41).

[illegible] Z-score [illegible] T-score [illegible] BMD [illegible]

[illegible] Z-score [illegible] Z-score. [illegible]

[illegible] Weinberg et al[143] [illegible]

[illegible]. [illegible] Vogiatzi et al[145] [illegible] Chanet et al[146] [illegible] (47) % [illegible].[152] [illegible]

A[illegible] 2[d]

[illegible].[135] [illegible] Alvarez et al[155] [illegible] Kamiya et al[156] [illegible] (p<0,01) [illegible] (p<0,01) [illegible] (p<0,05). [illegible] Yoshida et al[157] [illegible]

[illegible] Hitoshi et al[158], [illegible] 2 [illegible] Chion et al[159], [illegible] (WHR). [illegible] 2 [illegible][160] [illegible][139] [illegible] Hayashi et al.[151] [illegible] Goodpaster et al[127] [illegible] SFR. [illegible] (subscapular to triceps skinfold ratio) [illegible] VLDL [illegible][7]

[illegible] D-XA, [illegible]

[illegible]

[illegible]:

- [illegible]
- [illegible]
- [illegible] SFR [illegible]

[illegible] Oshaug et al[123] [illegible] WTR (Waist-to-Thigh Ratio), [illegible] Gillum et al[121] [illegible] WHR [illegible]

[illegible] WHR. [illegible] Fernandez-Real et al[124], [illegible] (36 [illegible]). [illegible] Iwasaki et al[111], [illegible] (p<0,0001) [illegible] (p[illegible]0,0005).

[illegible] SFR [illegible] Gillum et al[121], [illegible] 20-45 [illegible]

[illegible][111]

[illegible]

[illegible]

[illegible] BMD [illegible] Liu Jian-min et al[72] [illegible] IGF-1 [illegible] IGF-1 [illegible] 30 [illegible] 40 [illegible][76]

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