

# Hypogonadism in Nigerian men with type 2 diabetes mellitus

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## Abstract

Hypogonadism in patients with diabetes mellitus (DM) has been associated with insulin resistance and poor glycaemic control. This study was conducted to determine the prevalence, types, and associations of hypogonadism in Nigerian men with established type 2 diabetes mellitus. The study was a cross-sectional observational work, which was conducted at the Lagos University Teaching Hospital (LUTH). The participants consisted of 108 men with type 2 DM and 56 non-diabetic controls. A questionnaire was used to obtain demographic data while the Androgen Deficiency in Aging Male (ADAM) questionnaire was administered to elicit symptoms of hypogonadism. The enzyme-linked immunosorbent assay (ELISA) method was used to test for serum-free testosterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactin, and estradiol. Other investigations done included fasting lipid profile, fasting plasma glucose, and glycated haemoglobin (HbA<sub>1c</sub>). Statistical analysis was done with SPSS v20. Tests of normality were carried out on the data to determine appropriate statistical analytic methods. The mean ( $\pm$ SD) ages of the DM patients and controls were  $51.7 \pm 5.9$  and  $50.9 \pm 4.6$  years, respectively ( $p = 0.349$ ), with a mean duration of diabetes  $93.6 \pm 6.29$  months. Among the DM patients, 17 (15.7 %) were obese, while 6 (10.7 %) controls had obesity. Hypogonadism

(predominantly secondary in (78.5 %)) was present in 42 (38.9 %) of the DM patients. In the controls, only 2 (3.6 %) had hypogonadism. Predictors of hypogonadism were a high HbA1c. Hypogonadism, which was predominantly secondary hypogonadism, was prevalent in the patients and was associated with HbA1c levels.

## Keywords

Hypogonadism Type 2 diabetes Glycaemic control  
Testosterone Nigeria

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## Notes

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## Compliance with ethical standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Lagos University Teaching Hospital research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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## Conflict of interest

The authors declare that they have no conflict of interest.

# Informed consent

Informed consent was obtained from all individual participants included in the study.

## References

1. Dhindsa S, Prabhakar S, Sethi M. Frequent occurrence of hypogonadotropic hypogonadism in type 2 diabetes. *J Clin Endocrinol Metab.* 2004;89:62–8.  
CrossRef (<https://doi.org/10.1210/jc.2004-0804>)  
Google Scholar  
([http://scholar.google.com/scholar\\_lookup?title=Frequent%20occurrence%20of%20hypogonadotropic%20hypogonadism%20in%20type%202%20diabetes&author=S.%20Dhindsa&author=S.%20Prabhakar&author=M.%20Sethi&journal=J%20Clin%20Endocrinol%20Metab&volume=89&pages=62-68&publication\\_year=2004](http://scholar.google.com/scholar_lookup?title=Frequent%20occurrence%20of%20hypogonadotropic%20hypogonadism%20in%20type%202%20diabetes&author=S.%20Dhindsa&author=S.%20Prabhakar&author=M.%20Sethi&journal=J%20Clin%20Endocrinol%20Metab&volume=89&pages=62-68&publication_year=2004))
2. Morley JE, Kaiser FE, Perry HM. Longitudinal changes in testosterone, luteinizing hormone, and follicle-stimulating hormone in healthy older men. *Metabolism.* 1997;46:410–3.  
CrossRef ([https://doi.org/10.1016/S0026-0495\(97\)90057-3](https://doi.org/10.1016/S0026-0495(97)90057-3))  
PubMed  
([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=9109845](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=9109845))  
Google Scholar  
([http://scholar.google.com/scholar\\_lookup?title=Longitudinal%20changes%20in%20testosterone%2C%20luteinizing%20hormone%2C%20and%20follicle-stimulating%20hormone%20in%20healthy%20older%20men&author=JE.%20Morley&author=FE.%20Kaiser&author=HM.%20Perry&journal=Metabolism&volume=46&pages=410-413&publication\\_year=1997](http://scholar.google.com/scholar_lookup?title=Longitudinal%20changes%20in%20testosterone%2C%20luteinizing%20hormone%2C%20and%20follicle-stimulating%20hormone%20in%20healthy%20older%20men&author=JE.%20Morley&author=FE.%20Kaiser&author=HM.%20Perry&journal=Metabolism&volume=46&pages=410-413&publication_year=1997))
3. Harman SM, Metter EJ, Tobin JD, Pearson JC, MR B. Baltimore longitudinal study of aging. Longitudinal effects of aging on serum total and free testosterone levels in healthy men. *J Clin Endocrinol Metab.* 2001;86(2):724–31.  
CrossRef (<https://doi.org/10.1210/jcem.86.2.7219>)  
PubMed

([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=11158037](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11158037))

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Baltimore%20longitudinal%20study%20of%20aging.%20Longitudinal%20effects%20of%20aging%20on%20serum%20total%20and%20free%20testosterone%20levels%20in%20healthy%20men&author=SM.%20Harman&author=EJ.%20Metter&author=JD.%20Tobin&author=JC.%20Pearson&author=B.%20MR&journal=J%20Clin%20Endocrinol%20Metab&volume=86&issue=2&pages=724-731&publication\\_year=2001](http://scholar.google.com/scholar_lookup?title=Baltimore%20longitudinal%20study%20of%20aging.%20Longitudinal%20effects%20of%20aging%20on%20serum%20total%20and%20free%20testosterone%20levels%20in%20healthy%20men&author=SM.%20Harman&author=EJ.%20Metter&author=JD.%20Tobin&author=JC.%20Pearson&author=B.%20MR&journal=J%20Clin%20Endocrinol%20Metab&volume=86&issue=2&pages=724-731&publication_year=2001))

4. Paresh D, Sandeep D, Ajay C, Visual B, Shehzad T, Priya M. Hypogonadotropic hypogonadism in type 2 diabetes, obesity and the metabolic syndrome. *Current molecular med* 2008; 816–828.

Google Scholar (<https://scholar.google.com/scholar?q=Paresh%20D%2C%20Sandeep%20D%2C%20Ajay%20C%2C%20Visual%20B%2C%20Shehzad%20T%2C%20Priya%20M.%20Hypogonadotropic%20hypogonadism%20in%20type%202%20diabetes%2C%20obesity%20and%20the%20metabolic%20syndrome.%20Current%20molecular%20med%202008%3B%20816%E2%80%93828>.)

5. Kapoor D, Malkin CJ, Channer KS, Jones TH. Androgens, insulin resistance and vascular disease in men. *Clin Endocrinol.* 2005;63:239–50.

CrossRef (<https://doi.org/10.1111/j.1365-2265.2005.02299.x>)

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Androgens%2C%20insulin%20resistance%20and%20ovascular%20disease%20in%20men&author=D.%20Kapoor&author=CJ.%20Malkin&author=KS.%20Channer&author=TH.%20Jones&journal=Clin%20Endocrinol&volume=63&pages=239-250&publication\\_year=2005](http://scholar.google.com/scholar_lookup?title=Androgens%2C%20insulin%20resistance%20and%20ovascular%20disease%20in%20men&author=D.%20Kapoor&author=CJ.%20Malkin&author=KS.%20Channer&author=TH.%20Jones&journal=Clin%20Endocrinol&volume=63&pages=239-250&publication_year=2005))

6. Simon D, Preziosi P, Barrett-Connor E, Roger M, Saint-Paul M, Nahoul K, Papoz L. Interrelation between plasma testosterone and plasma insulin in healthy adult men: the Telecom study. *Diabetologia.* 1992;35:173–7.

CrossRef (<https://doi.org/10.1007/BF00402551>)

PubMed

([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=15](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=15))

47923)

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Interrelation%20between%20plasma%20testosterone%20and%20plasma%20insulin%20in%20healthy%20adult%20women%3A%20the%20Telecom%20study&author=D.%20Simon&author=P.%20Preziosi&author=E.%20Barrett-Connor&author=M.%20Roger&author=M.%20Saint-Paul&author=K.%20Nahoul&author=L.%20Papoz&journal=Diabetologia&volume=35&pages=173-177&publication\\_year=1992](http://scholar.google.com/scholar_lookup?title=Interrelation%20between%20plasma%20testosterone%20and%20plasma%20insulin%20in%20healthy%20adult%20women%3A%20the%20Telecom%20study&author=D.%20Simon&author=P.%20Preziosi&author=E.%20Barrett-Connor&author=M.%20Roger&author=M.%20Saint-Paul&author=K.%20Nahoul&author=L.%20Papoz&journal=Diabetologia&volume=35&pages=173-177&publication_year=1992))

7. Oh JY, Barrett-Connor E, Wedick NM, Wingard DL. Endogenous sex hormones and the development of type 2 diabetes in older men and women. *Diabetes Care*. 2002;25:55–60.

CrossRef (<https://doi.org/10.2337/diacare.25.1.55>)

PubMed

([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=11772901](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=11772901))

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Endogenous%20sex%20hormones%20and%20the%20development%20of%20type%202%20diabetes%20in%20older%20men%20and%20women&author=JY.%20Oh&author=E.%20Barrett-Connor&author=NM.%20Wedick&author=DL.%20Wingard&journal=Diabetes%20Care&volume=25&pages=55-60&publication\\_year=2002](http://scholar.google.com/scholar_lookup?title=Endogenous%20sex%20hormones%20and%20the%20development%20of%20type%202%20diabetes%20in%20older%20men%20and%20women&author=JY.%20Oh&author=E.%20Barrett-Connor&author=NM.%20Wedick&author=DL.%20Wingard&journal=Diabetes%20Care&volume=25&pages=55-60&publication_year=2002))

8. Stellato RK, Feldman HA, Hamdy OS, Horton ES, McKinlay JB. Testosterone, sex hormone-binding globulin and the development of type 2 diabetes in middle-aged men. *Diabetes Care*. 2000;23:490–4.

CrossRef (<https://doi.org/10.2337/diacare.23.4.490>)

PubMed

([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=10857940](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10857940))

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Testosterone%20C%20sex%20hormone-binding%20globulin%20and%20the%20development%20of%20type%202%20diabetes%20in%20middle-aged%20men&author=RK.%20Stellato&author=HA.%20Feldman&author=OS.%20Hamdy&author=ES.%20Horton](http://scholar.google.com/scholar_lookup?title=Testosterone%20C%20sex%20hormone-binding%20globulin%20and%20the%20development%20of%20type%202%20diabetes%20in%20middle-aged%20men&author=RK.%20Stellato&author=HA.%20Feldman&author=OS.%20Hamdy&author=ES.%20Horton))

&author=JB.%20McKinlay&journal=Diabetes%20Care&volume=23&pages=490-494&publication\_year=2000)

9. Morley J, Charlton E, Patrick P. Validation of a screening questionnaire for androgen deficiency in ageing males. *Metab.* 2000;49:1239–42.  
CrossRef (<https://doi.org/10.1053/meta.2000.8625>)  
Google Scholar  
([http://scholar.google.com/scholar\\_lookup?title=Validation%20of%20a%20screening%20questionnaire%20for%20androgen%20deficiency%20in%20ageing%20males&author=J.%20Morley&author=E.%20Charlton&author=P.%20Patrick&journal=Metab&volume=49&pages=1239-1242&publication\\_year=2000](http://scholar.google.com/scholar_lookup?title=Validation%20of%20a%20screening%20questionnaire%20for%20androgen%20deficiency%20in%20ageing%20males&author=J.%20Morley&author=E.%20Charlton&author=P.%20Patrick&journal=Metab&volume=49&pages=1239-1242&publication_year=2000))
10. Olarinoye JK, Kuranga SA, Katibi IA, Adediran OS, Jimoh AA, Sanya EO. Prevalence and determinants of erectile dysfunction among people with type 2 diabetes in Ilorin, Nigeria. *Niger Postgrad Med J.* 2006;13:291–6.  
PubMed  
([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=17203117](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=17203117))  
Google Scholar  
([http://scholar.google.com/scholar\\_lookup?title=Prevalence%20and%20determinants%20of%20erectile%20dysfunction%20among%20people%20with%20type%20%20diabetes%20in%20Ilorin%20C%20Nigeria&author=JK.%20Olarinoye&author=SA.%20Kuranga&author=IA.%20Katibi&author=OS.%20Adediran&author=AA.%20Jimoh&author=EO.%20Sanya&journal=Niger%20Postgrad%20Med%20J&volume=13&pages=291-296&publication\\_year=2006](http://scholar.google.com/scholar_lookup?title=Prevalence%20and%20determinants%20of%20erectile%20dysfunction%20among%20people%20with%20type%20%20diabetes%20in%20Ilorin%20C%20Nigeria&author=JK.%20Olarinoye&author=SA.%20Kuranga&author=IA.%20Katibi&author=OS.%20Adediran&author=AA.%20Jimoh&author=EO.%20Sanya&journal=Niger%20Postgrad%20Med%20J&volume=13&pages=291-296&publication_year=2006))
11. Kuku SF. African endocrine infertility: a review. *Afr. J. Med Sci.* 1995; 24: 1118; 123  
Google Scholar (<https://scholar.google.com/scholar?q=Kuku%20SF.%20African%20endocrine%20infertility%3A%20a%20review.%20Afr.%20J.%20Med%20Sci.%201995%3B%2024%3A%201118%3B%20123>)
12. Modebe O, Ezeh U. Effect of age on testicular function of adult males with sickle cell anaemia. *J Clin Endocrine Metab.* 1989;68:511–5.  
CrossRef (<https://doi.org/10.1210/jcem-68-3-511>)  
Google Scholar  
([http://scholar.google.com/scholar\\_lookup?title=Effect%20of%20age%20on%20testicular%20functio](http://scholar.google.com/scholar_lookup?title=Effect%20of%20age%20on%20testicular%20functio)

n%20of%20adult%20males%20with%20sickle%20cell%20anaemia&author=O.%20Modebe&author=U.%20Ezeh&journal=J%20Clin%20Endocrine%20Metab&volume=68&pages=511-515&publication\_year=1989)

13. Geidam A Hormonal profile of men investigated for infertility at the University of Maiduguri in Northern Nigeria. *Singap Med J.* 2008;49:538–41.

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Hormonal%20profile%20of%20men%20investigated%20for%20infertility%20at%20the%20University%20of%20Maiduguri%20in%20Northern%20Nigeria&author=A.%20Geidam&journal=Singap%20Med%20J&volume=49&pages=538-541&publication\\_year=2008](http://scholar.google.com/scholar_lookup?title=Hormonal%20profile%20of%20men%20investigated%20for%20infertility%20at%20the%20University%20of%20Maiduguri%20in%20Northern%20Nigeria&author=A.%20Geidam&journal=Singap%20Med%20J&volume=49&pages=538-541&publication_year=2008))

14. Ogbera O, Chinenye S, Fasanmade O, Ajala W. Hypogonadism and subnormal total testosterone levels in men with type 2 diabetes mellitus. *Journal of the College Of Physicians And Surgeons, Pakistan.* 2011;21:517–21.

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Hypogonadism%20and%20subnormal%20total%20testosterone%20levels%20in%20men%20with%20type%202%20diabetes%20mellitus&author=O.%20Ogbera&author=S.%20Chinenye&author=O.%20Fasanmade&author=W.%20Ajala&journal=Journal%20of%20the%20College%20Of%20Physicians%20And%20Surgeons%2C%20Pakistan&volume=21&pages=517-521&publication\\_year=2011](http://scholar.google.com/scholar_lookup?title=Hypogonadism%20and%20subnormal%20total%20testosterone%20levels%20in%20men%20with%20type%202%20diabetes%20mellitus&author=O.%20Ogbera&author=S.%20Chinenye&author=O.%20Fasanmade&author=W.%20Ajala&journal=Journal%20of%20the%20College%20Of%20Physicians%20And%20Surgeons%2C%20Pakistan&volume=21&pages=517-521&publication_year=2011))

15. Dhindsa S, Upadhyay M, Viswanathan O. Relationship of prostate specific antigen to age and testosterone in men with type 2 diabetes mellitus *Endocrine Pract* 2008; 14:100–5.

Google Scholar (<https://scholar.google.com/scholar?q=Dhindsa%20S%2C%20Upadhyay%20M%2C%20Viswanathan%20O.%20Relationship%20of%20prostate%20specific%20antigen%20to%20age%20and%20testosterone%20in%20men%20with%20type%202%20diabetes%20mellitus%20Endocrine%20Pract%202008%3B%2014%3A100%E2%80%935>.)

(<https://scholar.google.com/scholar?q=Dhindsa%20S%2C%20Upadhyay%20M%2C%20Viswanathan%20O.%20Relationship%20of%20prostate%20specific%20antigen%20to%20age%20and%20testosterone%20in%20men%20with%20type%202%20diabetes%20mellitus%20Endocrine%20Pract%202008%3B%2014%3A100%E2%80%935>.)

16. Crook MA. The reproductive system; in clinical biochemistry and molecular medicine. Hodder and Stoughton Limited. 2012. pp.146–156.

Google Scholar (<https://scholar.google.com/scholar?q=Crook%20MA.%20The%20reproductive%20system%3B%20in%20clinical%20biochemistry%20and%20molecular>

<https://scholar.google.com/scholar?q=Crook%20MA.%20The%20reproductive%20system%3B%20in%20clinical%20biochemistry%20and%20molecular>

%20medicine.%20Hodder%20and%20Stoughton%20Limited.%202012.%20pp.146%E2%80%93156.)

17. Kish H, Leslie C. A procedure for objective respondent selection within the household. *Journal of the American Statistical Association*. 1949;44:380–7.  
CrossRef (<https://doi.org/10.1080/01621459.1949.10483314>)  
Google Scholar ([http://scholar.google.com/scholar\\_lookup?title=A%20procedure%20for%20objective%20respondent%20selection%20within%20the%20household&author=H.%20Kish&author=C.%20Leslie&journal=Journal%20of%20the%20American%20Statistical%20Association.&volume=44&pages=380-387&publication\\_year=1949](http://scholar.google.com/scholar_lookup?title=A%20procedure%20for%20objective%20respondent%20selection%20within%20the%20household&author=H.%20Kish&author=C.%20Leslie&journal=Journal%20of%20the%20American%20Statistical%20Association.&volume=44&pages=380-387&publication_year=1949))
18. American Diabetes Association. Standards of medical care in diabetes 2015. *Diabetes Care* 2015;38(Suppl. 1):S1–S2 | doi: [10.2337/dc15-S001](https://doi.org/10.2337/dc15-S001) (<https://doi.org/10.2337/dc15-S001>).
19. Kim JS, Kim BS, Jeon JY, Choi YJ, Chung YS. Testosterone deficiency associated with poor glycaemic control in Korean male diabetics. *Endocrinol Metab*. 2014;29:300–6.  
CrossRef (<https://doi.org/10.3803/EnM.2014.29.3.300>)  
Google Scholar ([http://scholar.google.com/scholar\\_lookup?title=Testosterone%20deficiency%20associated%20with%20poor%20glycaemic%20control%20in%20Korean%20male%20diabetics&author=JS.%20Kim&author=BS.%20Kim&author=JY.%20Jeon&author=YJ.%20Choi&author=YS.%20Chung&journal=Endocrinol%20Metab&volume=29&pages=300-306&publication\\_year=2014](http://scholar.google.com/scholar_lookup?title=Testosterone%20deficiency%20associated%20with%20poor%20glycaemic%20control%20in%20Korean%20male%20diabetics&author=JS.%20Kim&author=BS.%20Kim&author=JY.%20Jeon&author=YJ.%20Choi&author=YS.%20Chung&journal=Endocrinol%20Metab&volume=29&pages=300-306&publication_year=2014))
20. Kapoor D, Godwin E, Channer K, Jones T. Testosterone replacement therapy improves insulin resistance, glycaemic control, visceral adiposity and hypercholesterolaemia in hypogonadal men with type 2 diabetes. *Eur J Endocrinol*. 2006;154:899–906.  
CrossRef (<https://doi.org/10.1530/eje.1.02166>)  
PubMed ([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=16728551](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=16728551))  
Google Scholar ([http://scholar.google.com/scholar\\_lookup?title=Testosterone%20replacement%20therapy%20improves%20insulin%20resistance%20C%20glycaemic%20control](http://scholar.google.com/scholar_lookup?title=Testosterone%20replacement%20therapy%20improves%20insulin%20resistance%20C%20glycaemic%20control)



%2C%20visceral%20adiposity%20and%20hypercholesterolaemia%20in%20hypogonadal%20men%20with%20type%202%20diabetes&author=D.%20Kapoor&author=E.%20Godwin&author=K.%20Channer&author=T.%20Jones&journal=Eur%20J%20Endocrinol&volume=154&pages=899-906&publication\_year=2006)

21. Fedele D Erectile dysfunction in type 1 and type 2 diabetics in Italy. On behalf of Gruppo Italiano Studio Deficit Erectile nei Diabetici. *Int J Epidemiol.* 2000;29:524–31.

CrossRef (<https://doi.org/10.1093/intjepid/29.3.524>)

PubMed

([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=10869326](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=10869326))

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Erectile%20dysfunction%20in%20type%201%20and%20type%202%20diabetics%20in%20Italy.%20On%20behalf%20of%20Gruppo%20Italiano%20Studio%20Deficit%20Erectile%20nei%20Diabetici&author=D.%20Fedele&journal=Int%20J%20Epidemiol&volume=29&pages=524-531&publication\\_year=2000](http://scholar.google.com/scholar_lookup?title=Erectile%20dysfunction%20in%20type%201%20and%20type%202%20diabetics%20in%20Italy.%20On%20behalf%20of%20Gruppo%20Italiano%20Studio%20Deficit%20Erectile%20nei%20Diabetici&author=D.%20Fedele&journal=Int%20J%20Epidemiol&volume=29&pages=524-531&publication_year=2000))

22. Uloko AE, Ofoegbu EN, Chinenye S, Fasanmade OA, Fasanmade AA, Ogbera AO. Profile of Nigerians with diabetes mellitus—Diabcare Nigeria Study Group (2008): results of a multi-centre study. *Indian J Endocrinol Metab.* 2012;16:981.

Google Scholar

([http://scholar.google.com/scholar\\_lookup?title=Profile%20of%20Nigerians%20with%20diabetes%20mellitus%E2%80%94Diabcare%20Nigeria%20Study%20Group%20%282008%29%3A%20results%20of%20a%20multi-centre%20study&author=AE.%20Uloko&author=EN.%20Ofoegbu&author=S.%20Chinenye&author=OA.%20Fasanmade&author=AA.%20Fasanmade&author=AO.%20Ogbera&journal=Indian%20J%20Endocrinol%20Metab&volume=16&pages=981&publication\\_year=2012](http://scholar.google.com/scholar_lookup?title=Profile%20of%20Nigerians%20with%20diabetes%20mellitus%E2%80%94Diabcare%20Nigeria%20Study%20Group%20%282008%29%3A%20results%20of%20a%20multi-centre%20study&author=AE.%20Uloko&author=EN.%20Ofoegbu&author=S.%20Chinenye&author=OA.%20Fasanmade&author=AA.%20Fasanmade&author=AO.%20Ogbera&journal=Indian%20J%20Endocrinol%20Metab&volume=16&pages=981&publication_year=2012))

23. Klein R. Hyperglycaemia and microvascular and macrovascular disease in diabetes. *Diabetes Care* 1995; 18:258–268

Google Scholar (<https://scholar.google.com/scholar?q=Klein%20R.%20Hyperglycaemia%20and%20microvascular%20and%20macrovascular%20disease%20in%20diab>

etes.%20Diabetes%20Care1995%3B%2018%3A258%E2%80%93268)

24. Corrales JJ, Burgo RM, Garca-Berrocal B, Almeida M, Alberca I, Gonzalez-Buitrago JM, Orfao A, Miralles JM. Partial androgen deficiency in aging type 2 diabetic men and its relationship to glycemic control. *Metabolism* 2004; 53:666–672.  
Google Scholar (<https://scholar.google.com/scholar?q=Corrales%20JJ%2C%20Burgo%20RM%2C%20Garca-Berrocal%20B%2C%20Almeida%20M%2C%20Alberca%20I%2C%20Gonzalez-Buitrago%20JM%2C%20Orfao%20A%2C%20Miralles%20JM.%20Partial%20androgen%20deficiency%20in%20aging%20type%202%20diabetic%20men%20and%20its%20relationship%20to%20glycemic%20control.%20Metabolism%202004%3B%2053%3A666%E2%80%93672.>)
25. Lester E, Woodroffe FJ, Smith PL. Prolactin and impotence in diabetes mellitus. *Ann Clin Biochem.* 1981;18:6–8.  
CrossRef (<https://doi.org/10.1177/000456328101800102>)  
PubMed ([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=7259065](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7259065))  
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26. Boyanov MA, Boneva Z, Christov VG Testosterone supplementation in men with type 2 diabetes, visceral obesity and partial androgen deficiency. *Aging Male.* 2003;6:1–7.  
CrossRef (<https://doi.org/10.1080/tam.6.1.1.7>)  
PubMed ([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=12809074](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=12809074))  
Google Scholar ([http://scholar.google.com/scholar\\_lookup?title=Testosterone%20supplementation%20in%20men%20with%20type%202%20diabetes%2C%20visceral%20obesity%20and%20partial%20androgen%20deficiency&author](http://scholar.google.com/scholar_lookup?title=Testosterone%20supplementation%20in%20men%20with%20type%202%20diabetes%2C%20visceral%20obesity%20and%20partial%20androgen%20deficiency&author)

=MA.%20Boyanov&author=Z.%20Boneva&author=VG.%20Christov&journal=Aging%20Male&volume=6&pages=1-7&publication\_year=2003)

27. Marin P, Oden B, Bjorntorp P Assimilation and mobilization of triglycerides in subcutaneous abdominal and femoral adipose tissue in vivo in men: effects of androgens. *J Clin Endocrinol Metab.* 1995;80:239–43.  
PubMed  
([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=7829619](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=7829619))  
Google Scholar  
([http://scholar.google.com/scholar\\_lookup?title=Assimilation%20and%20mobilization%20of%20triglycerides%20in%20subcutaneous%20abdominal%20and%20femoral%20adipose%20tissue%20in%20vivo%20in%20men%3A%20effects%20of%20androgens&author=P.%20Marin&author=B.%20Oden&author=P.%20Bjorntorp&journal=J%20Clin%20Endocrinol%20Metab&volume=80&pages=239-243&publication\\_year=1995](http://scholar.google.com/scholar_lookup?title=Assimilation%20and%20mobilization%20of%20triglycerides%20in%20subcutaneous%20abdominal%20and%20femoral%20adipose%20tissue%20in%20vivo%20in%20men%3A%20effects%20of%20androgens&author=P.%20Marin&author=B.%20Oden&author=P.%20Bjorntorp&journal=J%20Clin%20Endocrinol%20Metab&volume=80&pages=239-243&publication_year=1995))
28. Colosia AD, Palencia R, Khan S. Prevalence of hypertension and obesity in patients with type 2 diabetes mellitus in observational studies: a systematic literature review. *Diabetes Metab Syndr Obes.* 2013;6:327–38.  
CrossRef (<https://doi.org/10.2147/DMSO.S51325>)  
PubMed  
([http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list\\_uids=24082791](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstract&list_uids=24082791))  
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(<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3785394>)  
Google Scholar  
([http://scholar.google.com/scholar\\_lookup?title=Prevalence%20of%20hypertension%20and%20obesity%20in%20patients%20with%20type%202%20diabetes%20mellitus%20in%20observational%20studies%3A%20a%20systematic%20literature%20review&author=AD.%20Colosia&author=R.%20Palencia&author=S.%20Khan&journal=Diabetes%20Metab%20Syndr%20Obes&volume=6&pages=327-338&publication\\_year=2013](http://scholar.google.com/scholar_lookup?title=Prevalence%20of%20hypertension%20and%20obesity%20in%20patients%20with%20type%202%20diabetes%20mellitus%20in%20observational%20studies%3A%20a%20systematic%20literature%20review&author=AD.%20Colosia&author=R.%20Palencia&author=S.%20Khan&journal=Diabetes%20Metab%20Syndr%20Obes&volume=6&pages=327-338&publication_year=2013))

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