

# **Evaluation of The Potential Role of miR-214 in Osteoporosis via Osterix**

Thesis

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*By*

**Nesma Mohamed Fawzy Mostafa**

*M.B.B.Ch of General Medicine and Surgery – Ain Shams University  
Assistant Lecturer at Medical Biochemistry and Molecular Biology Department*

*Under Supervision of*

**Prof. Dr./ Magda M. Nagaty**

*Professor of Medical Biochemistry and Molecular Biology  
Faculty of Medicine, Ain Shams University*

**Dr./ Enas Samir Nabih**

*Assistant Professor of Medical Biochemistry and Molecular Biology  
Faculty of Medicine, Ain Shams University*

**Dr./ Radwan Gamal El-Deen**

*Lecturer of Orthopedic Surgery  
Faculty of Medicine, Ain Shams University*

Faculty of medicine  
Ain Shams University

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# قالوا

سببناك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدق الله العظيم

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## List of Abbreviations

Abbrev.	Full-term
<b>ALP</b>	: Alkaline phosphatase
<b>ATF4</b>	: Activating transcription factor 4
<b>AUC</b>	: Area under the curve
<b>BGLAP</b>	: Gamma-carboxyglutamic acid-containing protein
<b>BIRC7</b>	: Baculoviral IAP repeat-containing protein 7
<b>BMD</b>	: Bone mineral density
<b>BMI</b>	: Body mass index
<b>BMM</b>	: Bone marrow monocytes
<b>BMPs</b>	: Bone morphogenetic proteins
<b>BMSCs</b>	: Bone marrow mesenchymal stem cells
<b>BSP</b>	: Bone sialoprotein
<b>CatK</b>	: Cathepsin K
<b>Coll<math>\alpha</math>1</b>	: Collagen type I $\alpha$ 1
<b>CRP</b>	: C-Reactive Protein
<b>CT scan</b>	: Computed tomography scan
<b>CT</b>	: Threshold cycle
<b>DEXA</b>	: Dual X-ray absorptiometry
<b>DICER</b>	: An enzyme that in humans is encoded by the DICER1 gene
<b>Dlx5</b>	: Distal-less homeobox 5
<b>Dmp1</b>	: Dentin matrix protein 1
<b>Dnm3</b>	: Dynamin-3 is a protein that in humans is encoded by the DNMT3 gene

<b>dNTPs</b>	: Deoxyribonucleotide triphosphate
<b>DROSHA</b>	: Class 2 ribonuclease III enzyme encoded by the DROSHA gene
<b>FC</b>	: Fold change
<b>FN</b>	: False negatives
<b>FP</b>	: False positive
<b>FRAX</b>	: Fracture Risk Assessment
<b>HCC</b>	: Hepatocellular carcinoma
<b>HR-pQCT</b>	: High-resolution peripheral QCT
<b>LMHF</b>	: Low magnitude high frequency
<b>LRP5</b>	: Low-density lipoprotein receptor-related protein 5
<b>MDCT</b>	: High-resolution multidetector CT
<b>MEKK2</b>	: Mitogen-activated protein kinase kinase kinase 2
<b>miRNA</b>	: microRNA
<b>MMP13</b>	: Matrix Metalloproteinase 13
<b>MRI</b>	: Magnetic Resonance Imaging
<b>mRNA</b>	: Messenger RNA
<b>MSCs</b>	: Mesenchymal stem or stromal cells
<b>NFIC</b>	: Nuclear factor 1 C
<b>NPV</b>	: Negative predictive value
<b>nt</b>	: Nucleotide
<b>OC</b>	: Osteocalcin
<b>OD</b>	: Optical density
<b>OP</b>	: Osteopontin
<b>OPG</b>	: Osteoprotegerin
<b>Osx</b>	: Osterix

<b>PHEX</b>	: Phosphate regulating endopeptidase homolog X-linked
<b>PKA</b>	: Protein kinase A
<b>PKC</b>	: Protein kinase C
<b>PPV</b>	: Positive Predictive Value
<b>pQCT</b>	: Peripheral quantitative computed tomography
<b>PSI</b>	: Pseudoshikonin I
<b>Pten</b>	: Phosphatase and tensin homolog
<b>PTH</b>	: Parathyroid hormone
<b>QCT</b>	: Quantitative computed tomography
<b>QUS</b>	: Quantitative ultrasonography
<b>r</b>	: Pearson correlation
<b>RANKL</b>	: Receptor activator of nuclear factor kappa-B ligand
<b>RISC</b>	: RNA-induced silencing complex
<b>RNAa</b>	: RNA-induced gene activation
<b>RNAi</b>	: RNA interference
<b>ROC</b>	: Receiver Operating Characteristics curve
<b>RQ</b>	: Relative quantification
<b>rRNA</b>	: Ribosomal RNA
<b>RT</b>	: Reverse transcription
<b>RT-PCR</b>	: Reverse transcription polymerase chain reaction
<b>Runx2</b>	: Runt-related transcription factor 2
<b>Runx3</b>	: Runt-related transcription factor 3
<b>SATB2</b>	: Special AT-rich sequence-binding protein 2
<b>SCC</b>	: Squamous cell carcinoms
<b>SD</b>	: Standard deviation
<b>siRNAs</b>	: Short interfering RNAs

<b>SMURFs</b>	: Smad ubiquitination regulatory factors
<b>snoRNAs</b>	: Small nucleolar RNAs
<b>snRNAs</b>	: Small nuclear RNAs
<b>SOST</b>	: Sclerostin
<b>STAT1</b>	: Signal transducer and activator of transcription 1
<b>TGFβ</b>	: Transforming growth factor beta
<b>TN</b>	: True negative
<b>TNF</b>	: Tumor necrosis factor
<b>TP</b>	: True positive
<b>tRNAs</b>	: Transfer RNAs
<b>UBC9</b>	: Ubiquitin-conjugating enzyme 9
<b>UTR</b>	: Untranslated regions
<b>UV</b>	: Ultraviolet
<b>VDR</b>	: Vitamin D receptor
<b>XBP1</b>	: X-box binding protein 1



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## Abstract

**Background:** The identification of genes associated with osteoporosis can help reveal underlying biological mechanisms that may lead to development of new therapeutic targets or biomarkers for early detection of the disease.

**Aim of the study:** to investigate the involvement of the osteoblast-specific transcription factor “osterix” and miR-214 in the pathogenesis of primary osteoporosis.

**Patients and methods:** the expression of osterix gene and miR-214 in the bone samples was evaluated using real-time-polymerase chain reaction in osteoporotic patients (n = 26) compared to healthy controls (n = 14).

**Results:** The expression of miR-214 levels was significantly higher in the osteoporotic group as compared to the control group ( $P \leq 0.01$ ), on the other hand the expression of osterix level was significantly lower in the osteoporotic group as compared to the control group ( $P \leq 0.01$ ).

**Conclusion:**

Both osterix and miR-214 could have a potential role in the pathogenesis of primary osteoporosis.

**KEYWORDS:** Osterix , osteoporosis, miR-214, bone tissue