

Genome-Wide Association Studies of Myocardial Infarction: A Systematic Literature Review

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Abstract

Myocardial infarction (MI) remains a leading cause of morbidity and mortality worldwide, which can result in severe complications such as cardiac arrhythmia, heart failure, and sudden cardiac death. Genetic factors contribute to MI aetiology and have been studied through genome-wide association studies (GWAS). This systematic review aims to summarise all GWAS on MI reporting single-nucleotide polymorphisms (SNPs) reaching genome-wide significance ($p < 5 \times 10^{-8}$) and elucidate on their biological relevance and potential clinical utility. A systematic review was conducted in PubMed and the GWAS Catalog to identify eligible studies. This review included nine GWAS published between 2007 and 2023, conducted in both European and non-European cohorts. GWAS have identified multiple loci associated with MI, pinpointing potential biological pathways underlying MI and potential therapeutic targets, and enhancing risk prediction. Nonetheless, significant challenges remain, particularly the underrepresentation of diverse ancestries and the need for functional follow-up studies to define causal variants and clarify the mechanisms linking genetic variation to MI pathogenesis.

Key Words: genome-wide association study; genetics; myocardial infarction; single nucleotide polymorphisms; polygenic risk score; review

Abbreviations

CAD: Coronary artery disease

CARDIoGRAM: Coronary Artery Disease Genome-Wide Replication and Meta-Analysis

C4D: Coronary Artery Disease Genetics Consortium

eQTL: Expression quantitative trait locus

FH: Familial hypercholesterolaemia

GRACE: Global Registry of Acute Coronary Events

GRS: Genetic risk score

GWAS: Genome-wide association study

IL-1 β : Interleukin 1-beta

IL-6: Interleukin-6

LD: Linkage disequilibrium

LDL: Low-density lipoprotein

LDLR: Low-density lipoprotein receptor

lncRNA: Long non-coding RNA

MI: Myocardial infarction

PCA: Principal component analysis

PCSK9: Proprotein convertase subtilisin/kexin type 9

PRS: Polygenic risk score

SNP: Single nucleotide polymorphism

TIMI: Thrombolysis in Myocardial Infarction

TWAS: Transcriptome-wide association studies

Introduction

Myocardial infarction (MI) remains a worldwide challenge for health and social care systems since it is a leading cause of death with severe complications such as cardiac arrhythmia, heart failure, and sudden cardiac death [1-3]. The development of MI is influenced by both environmental and genetic factors. Traditional risk factors such as smoking, hypertension, and diabetes have long been established risk

factors for MI [4]. Genetic predisposition to MI was first implicated after family and twin studies observed aggregation of MI within families [5,6] Initially, MI was considered a monogenic disorder caused by rare variants in genes such as *LDLR*, *APOB*, and *PCSK9*, causing familial hypercholesterolemia [7]. However, research indicates that the genetic architecture of MI is more complex than initially thought. It could be speculated that MI follows an omnigenic model, in which all genes expressed in relevant tissues may contribute to the pathophysiology [8]. To elucidate this omnigenic model of MI, genome-wide association studies (GWAS) have become essential. GWAS examine the genome in a hypothesis-free manner to identify common variants associated with MI [9]. MI was one of the earliest and most comprehensively studied phenotypes through GWAS approaches [10]

GWAS compare the allele frequency of common variants, or single-nucleotide polymorphisms (SNP), across the entire genome between groups of individuals with shared ancestry, usually a group with a

particular disease or trait (cases) and a control group without it. For example, MI cases and controls without MI (**Figure 1**) [9]. Shared ancestry is essential, as allele frequencies vary across populations with different ancestral backgrounds [11]. After comparing allele frequencies between MI cases and controls, SNPs that occur significantly more frequently in MI cases are considered associated with MI. Given the large number of SNPs across the genome, multiple testing correction is performed [12] Therefore, a SNP is considered genome-wide significant when it has a p-value of $p < 5 \times 10^{-8}$. These genome-wide significant SNPs pinpoint loci associated with MI. A locus (plural: loci) is a topological reference point referring to a region on the chromosome. These genomic loci can span large regions, containing coding regions, encoding for proteins, and non-coding regions, encoding for, for example, microRNAs and long non-coding RNAs, that regulate gene expression [13-14] Notably, the majority of GWAS-identified SNPs are located in non-coding regions, highlighting the importance of regulatory elements in disease susceptibility.

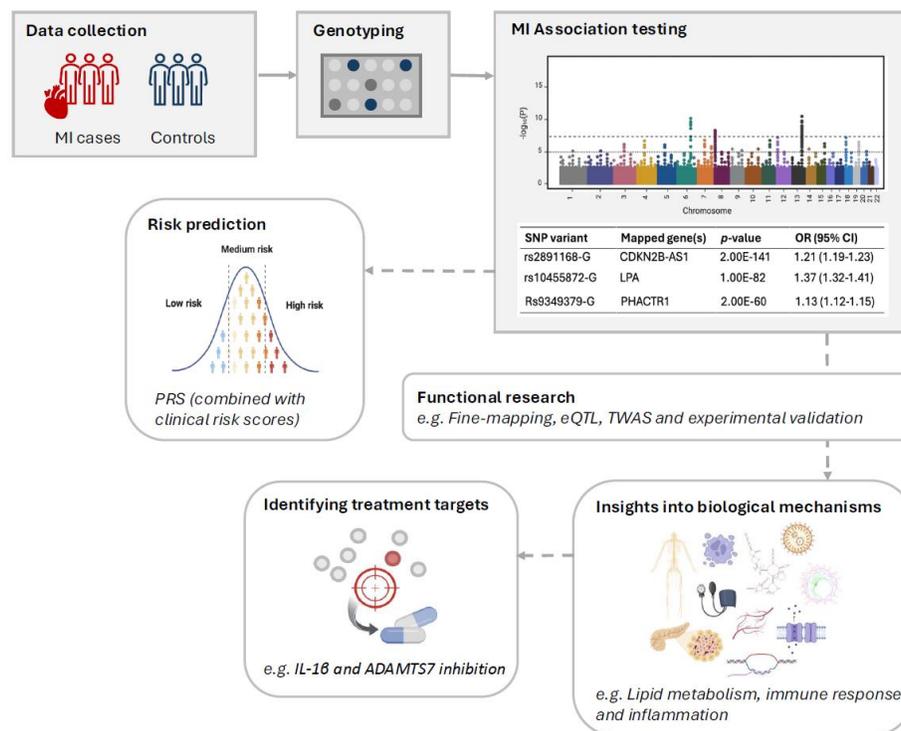


Figure 1: Overview of GWAS on MI workflow and its clinical implications

A SNP significantly associated with MI is not necessarily a causal variant, as SNPs can be in linkage disequilibrium (LD) with each other. This means that these SNPs are statistically associated and tend to be inherited together in a population because of their physical proximity on the chromosome [15]. Therefore, a SNP identified with GWAS may not be causal itself but could be in LD with the causal variant. Determining what variant is causal requires functional research. First, fine-mapping pinpoints the likely causal variants among SNPs in LD [16] followed by functional annotation to determine the biological relevance of the variants [17] Variants are then linked to target genes using approaches such as expression quantitative trait locus (eQTL) mapping and transcriptome-wide association studies (TWAS) [18] Finally, these genes can be connected to molecular pathways, and experimental validation can be performed [19]

Insights into the genes and molecular pathways underlying MI can have a clinical impact by identifying potential treatment targets and improving personalised risk prediction of MI in individuals [19] Polygenic risk

scores (PRS) are generated to identify individuals at elevated risk for MI. It enables the identification of those individuals even before clinical symptoms appear [20] This offers opportunities for early interventions, personalised prevention strategies, and refined risk stratification beyond traditional factors. A PRS is calculated using the effect size of all SNPs associated with MI, identified in GWAS regardless of their individual genome-wide significance [21]

We hypothesise that, since MI is one of the most extensively studied phenotypes through GWAS, the studies have identified numerous SNPs that provided insights into molecular pathways, revealed potential treatment targets, and enhanced risk prediction.

Materials and methods

Studies were included in this systematic review when 1) a GWAS of MI was performed, defined as a GWAS comparing MI cases to controls without MI, and 2) the identified SNPs were genome-wide significant ($p < 5 \times 10^{-8}$). Two reviewers performed the search for eligible studies in the

PubMed database and the GWAS Catalog (Figure 2), which was last updated on October 1st, 2025.

The GWAS Catalog is the online catalogue of GWAS hosted by the National Human Genome Research Institute. The catalogue was established to provide a single reliable and freely available database of SNPs associated with specific traits and diseases. Studies are included in the GWAS Catalog when 1] it analyses the human genome without limiting to candidate genes, 2] includes a primary GWAS analysis (defined as “array-based genotyping and analysis of 100,000+ pre-QC SNPs selected to tag variation across the genome and without regard to gene content”), and 3] was published in English [22]

The SNPs reported in this review are the genome-wide significant SNPs reported by the GWAS Catalog. The GWAS Catalog reported the SNPs in genome construct hg38 as follows: When a combined p-value was not reported, the p-value and effect size from the largest sample size were reported (as long as the samples showed $p < 1 \times 10^{-5}$ in initial and replication samples); When no replication was performed, the SNPs identified in the discovery stage were reported; When the SNP was the most significant SNP from an independent locus; When previously known SNPs (at the time of publication) met the genome-wide significance threshold, even without replication, they were reported.

Results

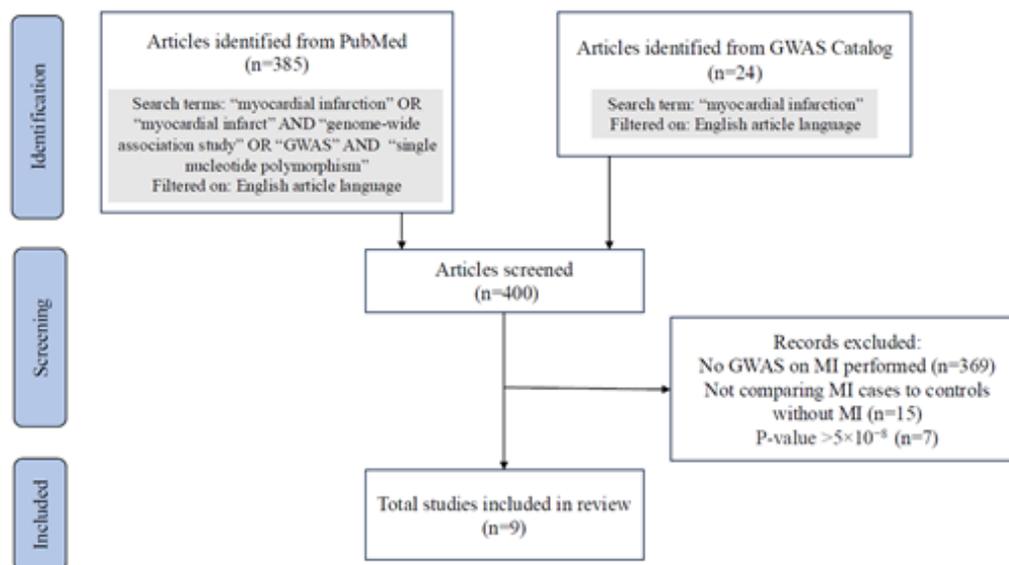


Figure 2: Flowchart of article search for GWAS of MI

In recent years, consortia have been formed, such as Coronary Artery Disease Genetics Consortium (C4D), Coronary Artery Disease Genome-Wide Replication and Meta-Analysis (CARDIoGRAM) consortium (merged in 2013 to CARDIoGRAMplusC4D) and the Myocardial Infarction Genetics Consortium, and large biobanks have been established [31-33] This enabled the study of bigger cohorts, which increased the statistical power of GWAS. For example, the UK Biobank is an advanced biobank consisting of data on over 500,000 individuals in the UK and is available through its public website [34] The most recently published GWAS of MI in European cohorts used this biobank, resulting in a cohort of 17,505 cases and 454,212 controls. The study identified 1,966 SNPs on 31 loci genome-wide significantly associated with MI. They replicated known variants for MI, on 9p21, and loci encoding for *LPA* and *SORT1*, and they identified eight new loci with genome-wide significance for MI. They subsequently confirmed the association of a locus on chromosome 1p21.3 harbouring *SLC44A3* with MI in the Biobank Japan [35]

In 2011, the first GWAS on MI in non-European cohorts that identified a genome-wide significant SNP was performed. They identified a genome-

The search for MI GWAS yielded nine eligible studies published in a period of 17 years (from 2007 to 2023) (Figure 2). Five European studies and four non-European studies were performed. The study characteristics are shown in Supplementary Table 1. Together, the studies identified 198 genome-wide significant SNPs on independent loci, including 110 reported in European and 144 in non-European cohorts (Supplementary Table 2).

In 2007, the first GWAS on MI in European cohorts that identified a genome-wide significant SNP was performed [23] They identified a common variant rs10757278 on chromosome 9p21, which contains the sequence encoding for *CDKN2A/B*, a tumour-suppressor gene regulating cell growth and division [24] whose association with MI was unknown before. Currently, this locus, 9p21.3, is the most replicated associated locus with MI (Supplementary Table 2). Subsequent studies in European cohorts identified more genome-wide significant variants associated with MI [25-27], including a variant on the *ABO* locus [26], encoding for proteins related to the blood group system [28], and the variant rs6941513 near *QKI*, encoding for a protein that is a regulator of pre-mRNA alternative splicing, which is highly expressed in adult and developing hearts (29). Multiple variants identified in these GWAS were previously identified as variants associated with coronary artery disease (CAD), underscoring the likely shared genetic basis between CAD and MI [30]

wide significant variant on chromosome 5p15.3 that acts as a protective factor for MI [36] Subsequent studies in non-European cohorts identified additional variants and loci associated with MI. Many of these overlapped with loci previously reported in European populations, including regions harbouring *LPA*, *PHACTR1*, *CELSR2*, as well as the most frequently replicated locus 9p21 [35] However, some identified variants and loci were only identified in European cohorts, for example, the locus harbouring *APOE* [35] or only in non-European cohorts, for example, the locus harbouring *ALDH2* [37] This underscores the importance of conducting GWAS on cohorts representing diverse ancestries. To date, GWAS on MI primarily focused on populations from European, middle Eastern, and Asian ancestry. Performing GWAS on cohorts from other ancestries will further maximise gene discovery and reduce the health disparities between European and non-European populations [38]

Locus in coding and non-coding regions

GWAS have identified MI-associated loci spanning both coding and non-coding regions, underscoring how variants in sequences encoding for

proteins and regulating gene expression collectively shape MI susceptibility. The genes mapped to these variants are shown in Supplementary Tables 2 and 3.

An example of a MI associated loci in a non-coding region, is the most replicated locus, 9p21, that is harbouring *CDKN2B-AS1*. *CDKN2B-AS1* is translated into long non-coding RNAs (lncRNA) that silence other genes in the *CDKN2B-CDKN2A* cluster, thereby regulating the gene expression of the cluster [24] At first, the relation of this potential mechanism to the MI mechanism was unknown. By performing a functional study, Li et al. found that the *CDKN2B-AS1* lncRNA inhibits *ADAM10* transcription, which promotes the efflux of cholesterol and prevents the atherosclerotic inflammatory response when active. Therefore, *CDKN2B-AS1* can prevent atherosclerotic formation, a well-known cause of MI [39] This study demonstrates how functional studies can elucidate the role of a previously unknown pathway to MI.

An example of a SNP in coding regions is the SNP rs368803408 on a locus harbouring the sequence for the Low-Density Lipoprotein Receptor (LDLR). Variants in *LDLR*, which mediates the uptake of cholesterol, are known to cause monogenic familial hypercholesterolemia, which is strongly associated with MI [40]

Another example of SNPs on coding regions is the three SNPs rs9982601, rs928758, and rs28451064, identified in both European and non-European cohorts. The SNPs are located on the locus that harbours the sequence encoding for *KCNE2*. *KCNE2* is a voltage-gated potassium channel gene expressed in muscles and the heart that regulates, among others, smooth muscle contraction, heart rate, neurotransmitter release, and insulin secretion [41] Loss-of-function *KCNE2* variants are

associated with long-QT syndrome and arrhythmia, including atrial fibrillation [42] These three SNPs, together with other ion-channel-encoding genes (Figure 3), point to specific pathways that may contribute to proarrhythmic susceptibility in MI. This may explain the occurrence of ventricular arrhythmias in the setting of acute MI [43] Further fundamental research is required to substantiate these findings.

Associated pathways and intermediate phenotypes

Genes linked to MI through GWAS are involved in multiple pathways, including the nervous system, blood pressure regulation, insulin resistance, and lipid metabolism (Figure 3) [44] These pathways influence quantifiable biological traits, known as intermediate phenotypes, such as elevated cholesterol levels, which serve as link between genetic variants and MI. Studying these phenotypes and the overlap between MI-associated variants and variants linked to intermediate phenotypes with established mechanisms may give a more direct understanding of the pathophysiological mechanisms underlying MI, early-stage MI, and atherosclerosis progression [45] For example, a variant associated with both MI and diabetes implies that (a part of) the pathophysiology of diabetes is involved in the pathophysiology of MI.

Dysregulated lipid metabolism is an intermediate phenotype linked to MI, characterized by elevated LDL cholesterol and increased atherosclerosis risk, a prerequisite for the development of MI. Overlapping SNPs associated with MI and lipid metabolism have been reported [45] including loci harbouring *ABO*, *APOE*, *LDRL*, and *LPA*. In addition to these well-known genes, multiple other MI-associated loci harbour genes linked to lipid metabolism (Figure 3).

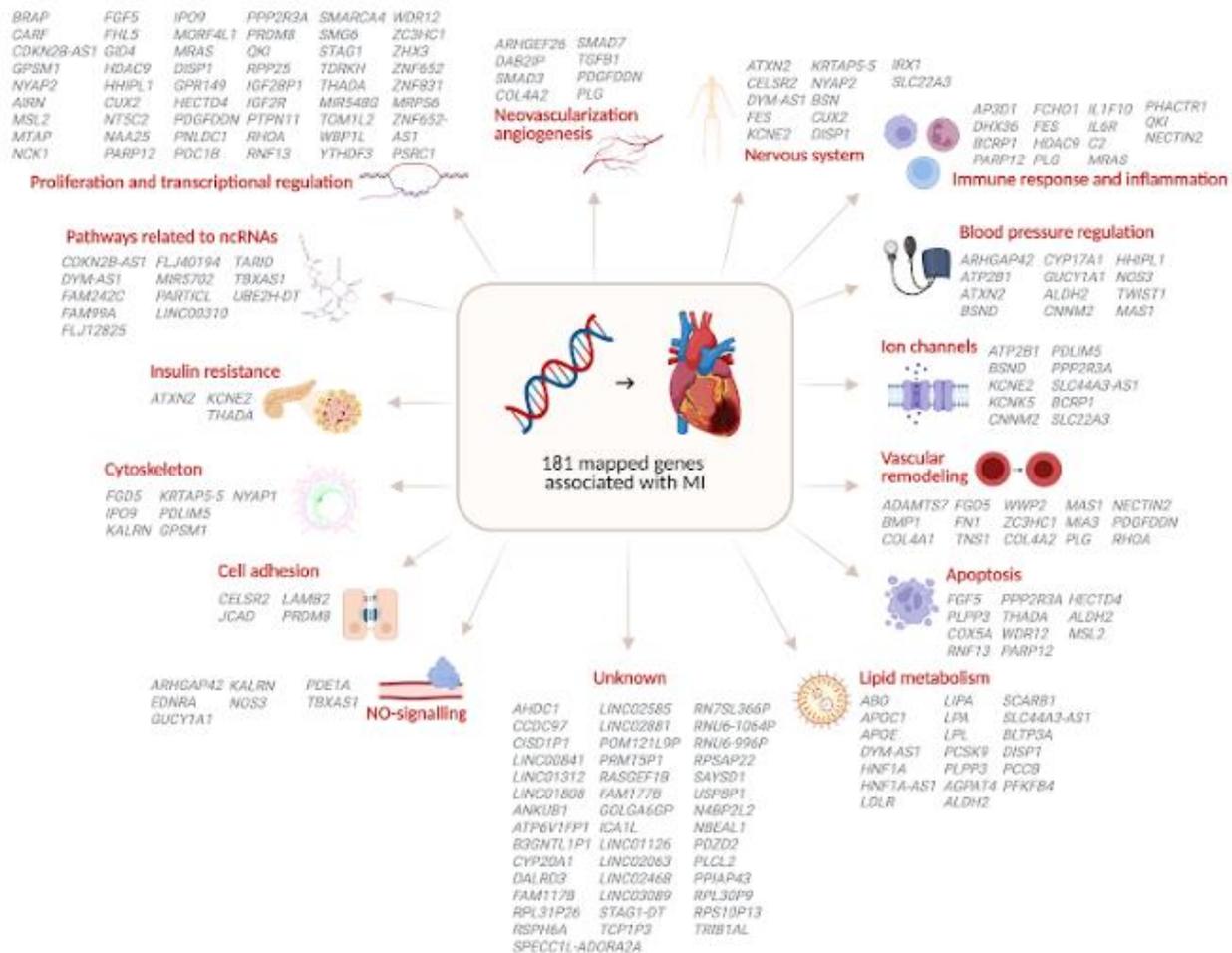


Figure 3: MI-associated genes and related pathophysiological pathways and mechanisms

Treatment targets

GWAS on MI, in combination with, amongst others, Mendelian randomisation, have identified MI-associated mechanisms that were already targeted by established treatments, such as Proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors and statins, as well as potential novel treatment targets[46-47].

PCSK9 regulates lipid homeostasis through binding to the low-density lipoprotein (LDL)-receptor and targeting it for degradation, resulting in an increased LDL-cholesterol concentration in the circulation [48-50]. High levels of PCSK9 are significantly associated with increased risk of cardiovascular disease [51-52]. Inhibition of PCSK9 has shown to reduce LDL-cholesterol by 60% [53], and can reduce risk of MI [54]

The first example of a treatment target pinpointed by GWAS results is interleukin-6 (IL-6). GWAS have identified variants at the IL6R locus associated with MI (35,37). Inhibition of the IL-6 receptor (IL-6R) is suggested to have cardiovascular benefit. The CANTOS trial showed that inhibition of interleukin 1-beta (IL-1 β), a component in the IL-6 signalling pathway, with a monoclonal antibody reduces cardiovascular event rates in patients with a history of coronary heart disease [55] Early-phase trials of Tocilizumab, an IL-6R inhibitor originally approved for rheumatoid arthritis, have shown promising results for cardiovascular effects [56]

Another potential target identified by GWAS is *ADAMTS7* [37] which encodes a metalloprotease involved in extracellular matrix degradation and atherosclerosis progression (26). Its causal role in atherosclerosis has been confirmed in vivo [57], and inhibitors of *ADAMTS7* are currently being explored in preclinical studies [58-59]

Further research is needed to determine the potential of those treatment targets, as well as additional treatment targets such as Sirtuin 1 (SIRT1). SNP variants in *SIRT1* have been associated with premature myocardial infarction [60-64]

Polygenic risk score for early risk prediction of MI

A PRS is calculated as the sum of the weighted effect size of SNPs associated with MI, regardless of their individual genome-wide significance [21] Therefore, a PRS captures the polygenic architecture of complex and common traits, such as MI, more comprehensively than a genetic risk score (GRS). A GRS is typically calculated by the sum of the effect size of the most significant variants, so not all identified SNPs [65] As the predictive power of PRS improves with the identification of additional SNPs of larger effect sizes, its integration into clinical practice could advance precision medicine. GWAS on MI have identified SNPs with effect sizes up to 1.39 (95% CI, 1.33-1.44) (Supplementary Tables 2 and 3).

Several studies have evaluated PRS in MI and CAD cohorts. Khera et al. showed the potential of a genome-wide PRS (comprised of 6.6 million SNPs) for improving CAD risk prediction[20]. They identified 8% of the cohort at greater than 3-fold increased risk for CAD. This PRS was derived from a GWAS with 184,305 participants and was validated in the UK Biobank [34,66]

Combining polygenic risk score with clinical risk scores

Currently used clinical risk scores for recurrence of MI, such as GRACE (Global Registry of Acute Coronary Events) and TIMI (Thrombolysis in Myocardial Infarction) Risk scores, use commonly available clinical and laboratory variables that don't include genetic factors [67] To improve risk prediction for MI, PRS can be combined with these clinical risk models. A study on PRS for cardiovascular diseases showed that combining PRS with clinical risk models significantly improved the identification of individuals who experienced a major adverse cardiovascular event. This increase was especially seen in younger individuals [68] Adding PRS to standard clinical risk models of MI could therefore improve risk prediction for MI.

Conclusion

Over the past two decades, nine genome-wide association studies have identified genome-wide significant loci associated with MI, pinpointing potential biological pathways underlying MI and potential therapeutic targets, and improving genetic risk prediction. Nonetheless, significant challenges remain, particularly the underrepresentation of diverse ancestries and the need for functional follow-up studies to define causal variants and clarify the mechanisms linking genetic variation to MI pathogenesis.

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Author commitments

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Conflict of interest

None.

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Supplementary Material

PMID	Authors	Journal	Year	Study cohort
17478679	Helgadottir A, Thorleif	Science	2007	1,607 European ancestry cases, 6,728 European ancestry controls
19198609	Kathiresan S; Voight B	Nat Genet.	2009	2,967 European ancestry cases, 3,075 European ancestry controls
21239051	Reilly MP; Li M; He J	Lancet.	2011	5,783 European ancestry cases, 3,644 European ancestry controls
21107343	Aoki A; Ozaki K; Satc	J Hum Genet.	2011	194 Japanese ancestry cases, 1,539 Japanese ancestry controls
24916648	Hirokawa M; Morita F	Eur J Hum Genet.	2015	1,666 Japanese ancestry cases, 3,198 Japanese ancestry controls
26950853	Dehghan A; Bis JC; W	PLoS One	2016	1,570 European ancestry cases, at least 21,618 European ancestry controls
26708285	Wakil SM; Ram R; Mh	Atherosclerosis	2016	866 Saudi Arab ancestry cases, 371 Saudi Arab ancestry controls
33532862	Hartiala JA; Han Y; Jia	Eur Heart J	2021	17,505 European ancestry cases, 454,212 European ancestry controls
38072966	Al-Ali AK; Al-Rubais	Sci Rep	2023	3950 Saudi-Arabian cases, 2324 controls Saudi-Arabian controls

Supplementary Table 1. Characteristics of GWAS on MI included in the systematic review

riskAllele	pValue	pValueAn	riskFrequen	orValue	beta	ci	mappedGene	traitName	efoTraits	bgTrai	accessionl	locations	pubmei	author
rs2891168-G	2.00E-141	-	0.482997	1.21	-	[1.19-1.23]	CDKN2B-AS1	Myocardial infarction	myocardial infarction	-	GCST011365	9:22098620	33532862	Hartiala JA
rs10455872-G	1.00E-82	-	0.064671	1.37	-	[1.32-1.41]	LPA	Myocardial infarction	myocardial infarction	-	GCST011365	6:160589086	33532862	Hartiala JA
rs2891168-G	2.00E-68	-	0.483196	1.21	-	[1.18-1.23]	CDKN2B-AS1	Myocardial infarction	myocardial infarction	-	GCST011364	9:22098620	33532862	Hartiala JA
rs9349379-G	2.00E-60	-	0.406157	1.13	-	[1.12-1.15]	PHACTR1	Myocardial infarction	myocardial infarction	-	GCST011365	6:12903725	33532862	Hartiala JA
rs10455872-G	4.00E-58	-	0.074987	1.39	-	[1.33-1.44]	LPA	Myocardial infarction	myocardial infarction	-	GCST011364	6:160589086	33532862	Hartiala JA
rs4977574-G	3.00E-44	-	0.56	1.29	-	[1.25-1.34]	CDKN2B-AS1	Myocardial infarction (e	myocardial infarction	-	GCST000340	9:22098575	19198609	Kathiresan S
rs12740374-G	8.00E-32	-	0.788431	1.11	-	[1.09-1.13]	CELSR2	Myocardial infarction	myocardial infarction	-	GCST011365	1:109274968	33532862	Hartiala JA
rs9349379-G	1.00E-27	-	0.401524	1.13	-	[1.10-1.15]	PHACTR1	Myocardial infarction	myocardial infarction	-	GCST011364	6:12903725	33532862	Hartiala JA
rs35700460-G	2.00E-24	-	0.67406	1.09	-	[1.07-1.11]	MIA3	Myocardial infarction	myocardial infarction	-	GCST011365	1:222638065	33532862	Hartiala JA
rs10774625-A	3.00E-23	-	0.465241	1.08	-	[1.07-1.10]	ATXN2	Myocardial infarction	myocardial infarction	-	GCST011365	12:111472415	33532862	Hartiala JA
rs28451064-A	3.00E-22	-	0.12293	1.12	-	[1.10-1.15]	MRPS6,KCNE2,L	Myocardial infarction	myocardial infarction	-	GCST011365	21:34221526	33532862	Hartiala JA
rs429358-C	4.00E-22	-	0.139064	1.11	-	[1.09-1.14]	APOE	Myocardial infarction	myocardial infarction	-	GCST011365	19:44908684	33532862	Hartiala JA
rs72926767-G	1.00E-21	-	0.11543	1.12	-	[1.09-1.14]	CARF,WDR12	Myocardial infarction	myocardial infarction	-	GCST011365	2:202932091	33532862	Hartiala JA
rs10757278-G	1.00E-20	-	0.45	1.28	-	[1.22-1.35]	CDKN2B-AS1	Myocardial infarction	myocardial infarction	-	GCST000030	9:22124478	17478679	Helgadóttir A
rs1412445-T	1.00E-20	-	0.34881	1.08	-	[1.06-1.09]	LIPA	Myocardial infarction	myocardial infarction	-	GCST011365	10:89243047	33532862	Hartiala JA
rs2327426-T	3.00E-20	-	0.69726	1.08	-	[1.06-1.09]	TARID	Myocardial infarction	myocardial infarction	-	GCST011365	6:133881552	33532862	Hartiala JA
rs2519093-T	5.00E-19	-	0.184082	1.09	-	[1.07-1.11]	ABO	Myocardial infarction	myocardial infarction	-	GCST011365	9:133266456	33532862	Hartiala JA
rs12906125-A	7.00E-19	-	0.307922	1.08	-	[1.06-1.10]	FES	Myocardial infarction	myocardial infarction	-	GCST011365	15:90884382	33532862	Hartiala JA
rs2019090-A	2.00E-18	-	0.327984	1.07	-	[1.06-1.09]	PDGFDDN	Myocardial infarction	myocardial infarction	-	GCST011365	11:103798234	33532862	Hartiala JA
rs12740374-G	6.00E-18	-	0.777761	1.12	-	[1.09-1.15]	CELSR2	Myocardial infarction	myocardial infarction	-	GCST011364	1:109274968	33532862	Hartiala JA
rs10176176-T	9.00E-18	-	0.477885	1.07	-	[1.05-1.08]	PARTICL	Myocardial infarction	myocardial infarction	-	GCST011365	2:85534925	33532862	Hartiala JA
rs112374545-C	2.00E-17	-	0.891235	1.11	-	[1.08-1.14]	SMARCA4	Myocardial infarction	myocardial infarction	-	GCST011365	19:11078223	33532862	Hartiala JA
rs589655-C	2.00E-17	-	0.891214	1.1	-	[1.08-1.13]	LINC00841,LINC	Myocardial infarction	myocardial infarction	-	GCST011365	10:44249867	33532862	Hartiala JA
rs7173743-T	2.00E-17	-	0.554427	1.07	-	[1.05-1.08]	MORF4L1	Myocardial infarction	myocardial infarction	-	GCST011365	15:78849442	33532862	Hartiala JA
rs11591147-G	2.00E-16	-	0.984027	1.34	-	[1.25-1.44]	PCSK9	Myocardial infarction	myocardial infarction	-	GCST011365	1:55039974	33532862	Hartiala JA
rs1065853-G	2.00E-16	-	0.919748	1.18	-	[1.13-1.22]	APOC1,APOE	Myocardial infarction	myocardial infarction	-	GCST011364	19:44909976	33532862	Hartiala JA
rs17114046-A	3.00E-15	-	0.91049	1.11	-	[1.08-1.14]	PLPP3	Myocardial infarction	myocardial infarction	-	GCST011365	1:56500678	33532862	Hartiala JA
rs4846384-G	3.00E-15	-	0.691031	1.1	-	[1.07-1.12]	MIA3	Myocardial infarction	myocardial infarction	-	GCST011364	1:222624272	33532862	Hartiala JA
rs76442922-C	2.00E-14	-	0.324007	1.09	-	[1.07-1.12]	FES	Myocardial infarction	myocardial infarction	-	GCST011364	15:90885291	33532862	Hartiala JA
rs1966248-A	3.00E-14	-	0.690619	1.09	-	[1.07-1.12]	LINC01312,TAR1	Myocardial infarction	myocardial infarction	-	GCST011364	6:133838484	33532862	Hartiala JA
rs11617955-T	4.00E-14	-	0.892605	1.1	-	[1.07-1.13]	COL4A1	Myocardial infarction	myocardial infarction	-	GCST011365	13:110165755	33532862	Hartiala JA
rs10947786-G	6.00E-14	-	0.790758	1.07	-	[1.05-1.09]	KCNK5,SAYSD1	Myocardial infarction	myocardial infarction	-	GCST011365	6:39188634	33532862	Hartiala JA
rs11556924-C	6.00E-14	-	0.663201	1.06	-	[1.05-1.08]	ZC3HC1,UBE2H	Myocardial infarction	myocardial infarction	-	GCST011365	7:130023656	33532862	Hartiala JA
rs3530651-A	7.00E-14	-	0.476407	1.09	-	[1.06-1.11]	ATXN2	Myocardial infarction	myocardial infarction	-	GCST011364	12:111469628	33532862	Hartiala JA
rs2954021-A	3.00E-13	-	0.50042	1.06	-	[1.04-1.07]	TRIB1AL	Myocardial infarction	myocardial infarction	-	GCST011365	8:125469835	33532862	Hartiala JA
rs3918226-T	4.00E-13	-	0.068905	1.12	-	[1.09-1.16]	NO3	Myocardial infarction	myocardial infarction	-	GCST011365	7:150993088	33532862	Hartiala JA
rs72689147-G	7.00E-13	-	0.819431	1.07	-	[1.05-1.09]	GUCY1A1	Myocardial infarction	myocardial infarction	-	GCST011365	4:155718736	33532862	Hartiala JA
rs2681472-G	1.00E-12	-	0.184495	1.07	-	[1.05-1.09]	ATP2B1	Myocardial infarction	myocardial infarction	-	GCST011365	12:89615182	33532862	Hartiala JA
rs7137258-A	2.00E-12	-	0.066699	1.12	-	[1.09-1.16]	FAM242C,FLJ128	Myocardial infarction	myocardial infarction	-	GCST011365	12:54118380	33532862	Hartiala JA
rs11692588-C	2.00E-12	-	0.326652	1.06	-	[1.04-1.07]	HNF1A,HNF1A-A	Myocardial infarction	myocardial infarction	-	GCST011365	12:120978847	33532862	Hartiala JA
rs12983897-G	4.00E-12	-	0.466759	1.06	-	[1.04-1.07]	FCHO1	Myocardial infarction	myocardial infarction	-	GCST011365	19:17747755	33532862	Hartiala JA
rs28451064-A	7.00E-12	-	0.126529	1.12	-	[1.08-1.16]	MRPS6,KCNE2,L	Myocardial infarction	myocardial infarction	-	GCST011364	21:34221526	33532862	Hartiala JA
rs646776-T	8.00E-12	-	0.81	1.19	-	[1.13-1.26]	PSRC1,CELSR2	Myocardial infarction (e	myocardial infarction	-	GCST000340	1:109275908	19198609	Kathiresan S
rs10841443-G	9.00E-12	-	0.649365	1.06	-	[1.04-1.07]	LINC02468,TCP1	Myocardial infarction	myocardial infarction	-	GCST011365	12:20067099	33532862	Hartiala JA
rs1384705-C	3.00E-11	-	0.293909	1.08	-	[1.06-1.11]	PDGFDDN	Myocardial infarction	myocardial infarction	-	GCST011364	11:103826123	33532862	Hartiala JA
rs16986953-A	4.00E-11	-	0.083917	1.09	-	[1.06-1.12]	LINC01808,CISD	Myocardial infarction	myocardial infarction	-	GCST011365	2:19742712	33532862	Hartiala JA
rs73078367-C	5.00E-11	-	0.889069	1.08	-	[1.06-1.11]	LINC02585	Myocardial infarction	myocardial infarction	-	GCST011365	3:48670914	33532862	Hartiala JA
rs72743461-C	5.00E-11	-	0.785088	1.06	-	[1.04-1.08]	SMAD3	Myocardial infarction	myocardial infarction	-	GCST011365	15:67149412	33532862	Hartiala JA
rs11099493-A	5.00E-11	-	0.700502	1.06	-	[1.04-1.07]	RASGEF1B	Myocardial infarction	myocardial infarction	-	GCST011365	4:81665896	33532862	Hartiala JA
rs9982601-T	6.00E-11	-	0.13	1.2	-	[1.14-1.27]	KCNE2,LINC003	Myocardial infarction (e	myocardial infarction	-	GCST000340	21:34226827	19198609	Kathiresan S
rs368803408-A	6.00E-11	-	0.851071	1.11	-	[1.07-1.14]	LDLR,SMARCA4	Myocardial infarction	myocardial infarction	-	GCST011364	19:11085976	33532862	Hartiala JA
rs11591147-G	8.00E-11	-	0.983216	1.31	-	[1.21-1.42]	PCSK9	Myocardial infarction	myocardial infarction	-	GCST011364	1:55039974	33532862	Hartiala JA
rs7011846-A	1.00E-10	-	0.039786	1.16	-	[1.11-1.21]	LPL	Myocardial infarction	myocardial infarction	-	GCST011365	8:19928145	33532862	Hartiala JA
rs1967604-A	1.00E-10	-	0.295137	1.06	-	[1.04-1.07]	RNU6-1064P,RNU	Myocardial infarction	myocardial infarction	-	GCST011365	9:107768043	33532862	Hartiala JA
rs2760740-C	1.00E-10	-	0.300578	1.05	-	[1.04-1.07]	SMG6	Myocardial infarction	myocardial infarction	-	GCST011365	17:2117695	33532862	Hartiala JA

rs150289443-T	2.00E-10	-	0.115856	1.11	-	[1.08-1.15]	WDR12,CARF	Myocardial infarction	myocardial infarction	-	GCST011364	2:202964860	33532862	Hartiala JA
rs2400727-G	2.00E-10	-	0.745715	1.06	-	[1.04-1.08]	PPP2R3A	Myocardial infarction	myocardial infarction	-	GCST011365	3:136128069	33532862	Hartiala JA
rs10857147-T	2.00E-10	-	0.270595	1.06	-	[1.04-1.07]	FGF5,PRDM8	Myocardial infarction	myocardial infarction	-	GCST011365	4:80259918	33532862	Hartiala JA
rs9640375-C	2.00E-10	-	0.779956	1.06	-	[1.04-1.08]	PARP12	Myocardial infarction	myocardial infarction	-	GCST011365	7:140037544	33532862	Hartiala JA
rs7011846-A	3.00E-10	-	0.032209	1.22	-	[1.15-1.30]	LPL	Myocardial infarction	myocardial infarction	-	GCST011364	8:19928145	33532862	Hartiala JA
rs6841581-A	3.00E-10	-	0.151907	1.07	-	[1.05-1.09]	PRMT5P1,EDNR	Myocardial infarction	myocardial infarction	-	GCST011365	4:147480038	33532862	Hartiala JA
rs1704221-G	4.00E-10	-	0.892878	1.12	-	[1.08-1.15]	LINC00841,LINC	Myocardial infarction	myocardial infarction	-	GCST011364	10:44215482	33532862	Hartiala JA
rs112995129-A	4.00E-10	-	0.769474	1.08	-	[1.06-1.11]	-	Myocardial infarction	myocardial infarction	-	GCST011364	-	33532862	Hartiala JA
rs13324341-T	4.00E-10	-	0.157949	1.07	-	[1.04-1.09]	MRA8	Myocardial infarction	myocardial infarction	-	GCST011365	3:138352059	33532862	Hartiala JA
rs6694258-C	4.00E-10	-	0.444189	1.05	-	[1.03-1.06]	IL6R	Myocardial infarction	myocardial infarction	-	GCST011365	1:154456029	33532862	Hartiala JA
rs73045269-T	5.00E-10	-	0.149746	1.07	-	[1.05-1.09]	CCDC97,TGFB1	Myocardial infarction	myocardial infarction	-	GCST011365	19:41319286	33532862	Hartiala JA
rs9486719-G	7.00E-10	-	0.802273	1.06	-	[1.04-1.08]	FHL5	Myocardial infarction	myocardial infarction	-	GCST011365	6:96612248	33532862	Hartiala JA
rs2505083-C	7.00E-10	-	0.406858	1.05	-	[1.03-1.06]	JCAD	Myocardial infarction	myocardial infarction	-	GCST011365	10:30046193	33532862	Hartiala JA
rs34290943-T	8.00E-10	-	0.893367	1.08	-	[1.05-1.10]	LAMB2	Myocardial infarction	myocardial infarction	-	GCST011365	3:49124227	33532862	Hartiala JA
rs3772800-C	8.00E-10	-	0.16274	1.06	-	[1.04-1.08]	KALRN	Myocardial infarction	myocardial infarction	-	GCST011365	3:124719739	33532862	Hartiala JA
rs17465637-C	1.00E-09	-	0.72	1.14	-	[1.10-1.19]	MIA3	Myocardial infarction (e	myocardial infarction	-	GCST000340	1:222650187	19198609	Kathiresan S
rs12526453-C	1.00E-09	-	0.65	1.12	-	[1.08-1.17]	PHACTR1	Myocardial infarction (e	myocardial infarction	-	GCST000340	6:12927312	19198609	Kathiresan S
rs17115100-G	1.00E-09	-	0.893936	1.07	-	[1.05-1.10]	CYP17A1,WBP11	Myocardial infarction	myocardial infarction	-	GCST011365	10:102831636	33532862	Hartiala JA
rs2886722-G	1.00E-09	-	0.40358	1.07	-	[1.05-1.09]	PARTICL,RPSAP	Myocardial infarction	myocardial infarction	-	GCST011364	2:85515174	33532862	Hartiala JA
rs11810571-G	1.00E-09	-	0.795971	1.06	-	[1.04-1.08]	TDKHK	Myocardial infarction	myocardial infarction	-	GCST011365	1:151789832	33532862	Hartiala JA
rs13402621-C	1.00E-09	-	0.221026	1.06	-	[1.04-1.08]	LINC01126,THAI	Myocardial infarction	myocardial infarction	-	GCST011365	2:43231472	33532862	Hartiala JA
rs62076439-T	1.00E-09	-	0.336995	1.05	-	[1.03-1.07]	ZNF652	Myocardial infarction	myocardial infarction	-	GCST011365	17:49327266	33532862	Hartiala JA
rs1122608-G	2.00E-09	-	0.75	1.15	-	[1.10-1.20]	SMARCA4	Myocardial infarction (e	myocardial infarction	-	GCST000340	19:11052925	19198609	Kathiresan S
rs11617955-T	2.00E-09	-	0.888935	1.11	-	[1.07-1.15]	COL4A1	Myocardial infarction	myocardial infarction	-	GCST011364	13:110165755	33532862	Hartiala JA
rs1412444-T	2.00E-09	-	0.344095	1.07	-	[1.05-1.09]	LIPA	Myocardial infarction	myocardial infarction	-	GCST011364	10:89243170	33532862	Hartiala JA
rs11632963-A	3.00E-09	-	0.505476	1.07	-	[1.04-1.09]	MORF4L1	Myocardial infarction	myocardial infarction	-	GCST011364	15:78840302	33532862	Hartiala JA
rs12897285-T	3.00E-09	-	0.830532	1.06	-	[1.04-1.08]	HHIPL1	Myocardial infarction	myocardial infarction	-	GCST011365	14:99657718	33532862	Hartiala JA
rs12693302-G	3.00E-09	-	0.386197	1.05	-	[1.03-1.06]	PDE1A	Myocardial infarction	myocardial infarction	-	GCST011365	2:182346716	33532862	Hartiala JA
rs3918226-T	4.00E-09	-	0.077561	1.13	-	[1.08-1.17]	NOS3	Myocardial infarction	myocardial infarction	-	GCST011364	7:150993088	33532862	Hartiala JA
rs11057837-T	4.00E-09	-	0.101672	1.08	-	[1.05-1.11]	SCARB1	Myocardial infarction	myocardial infarction	-	GCST011365	12:124827174	33532862	Hartiala JA
rs73225849-C	5.00E-09	-	0.057606	1.1	-	[1.07-1.14]	BMP1	Myocardial infarction	myocardial infarction	-	GCST011365	8:22189710	33532862	Hartiala JA
rs11652894-C	5.00E-09	-	0.437104	1.05	-	[1.03-1.06]	GID4	Myocardial infarction	myocardial infarction	-	GCST011365	17:18049125	33532862	Hartiala JA
rs6941513-G	6.00E-09	(EA)	NR	1.2	-	[1.13-1.28]	RN7SL366P,QKI	Incident myocardial infarction	myocardial infarction	-	GCST003430	6:163609768	26950853	Dehghan A
rs2452009-A	6.00E-09	-	0.700493	1.05	-	[1.03-1.07]	PDLIM5	Myocardial infarction	myocardial infarction	-	GCST011365	4:94574757	33532862	Hartiala JA
rs1746048-C	7.00E-09	-	0.84	1.17	-	[1.11-1.24]	LINC03089,LINC	Myocardial infarction (e	myocardial infarction	-	GCST000340	10:44280376	19198609	Kathiresan S
rs514659-C	8.00E-09	-	0.37	1.21	-	[1.13-1.29]	ABO	Myocardial infarction in	myocardial infarction	coronary a	GCST000946	9:133266790	21239051	Reilly MP
rs34338189-T	8.00E-09	-	0.530916	1.06	-	[1.04-1.09]	FLJ40194	Myocardial infarction	myocardial infarction	-	GCST011364	17:49263299	33532862	Hartiala JA
rs61621482-G	8.00E-09	-	0.231189	1.05	-	[1.03-1.07]	ARHGAP42	Myocardial infarction	myocardial infarction	-	GCST011365	11:100699329	33532862	Hartiala JA
rs2954021-A	9.00E-09	-	0.493225	1.06	-	[1.04-1.09]	TRIB1AL	Myocardial infarction	myocardial infarction	-	GCST011364	8:125469835	33532862	Hartiala JA
rs6725887-C	1.00E-08	-	0.14	1.17	-	[1.11-1.23]	WDR12	Myocardial infarction (e	myocardial infarction	-	GCST000340	2:202881162	19198609	Kathiresan S
rs11206510-T	1.00E-08	-	0.81	1.15	-	[1.10-1.21]	PCSK9,BSND	Myocardial infarction (e	myocardial infarction	-	GCST000340	1:55030366	19198609	Kathiresan S
rs259979-T	1.00E-08	-	0.146134	1.06	-	[1.04-1.09]	ZNF831	Myocardial infarction	myocardial infarction	-	GCST011365	20:59175501	33532862	Hartiala JA
rs2107595-A	1.00E-08	-	0.176323	1.06	-	[1.04-1.08]	TWIST1,HDAC9	Myocardial infarction	myocardial infarction	-	GCST011365	7:19009765	33532862	Hartiala JA
rs12743267-C	1.00E-08	-	0.765129	1.05	-	[1.03-1.07]	SLC44A3-AS1	Myocardial infarction	myocardial infarction	-	GCST011365	1:94783750	33532862	Hartiala JA
rs16854041-A	1.00E-08	-	0.744632	1.05	-	[1.03-1.07]	FN1	Myocardial infarction	myocardial infarction	-	GCST011365	2:215422774	33532862	Hartiala JA
rs3094680-T	1.00E-08	-	0.601913	1.05	-	[1.03-1.06]	USP8P1	Myocardial infarction	myocardial infarction	-	GCST011365	6:31276118	33532862	Hartiala JA
rs180803-G	2.00E-08	-	0.97779	1.16	-	[1.10-1.22]	POM121L9P,BCR	Myocardial infarction	myocardial infarction	-	GCST011365	22:24262890	33532862	Hartiala JA
rs77870048-C	2.00E-08	-	0.949754	1.15	-	[1.09-1.20]	WWP2	Myocardial infarction	myocardial infarction	-	GCST011364	16:69931118	33532862	Hartiala JA
rs10841443-G	2.00E-08	-	0.658908	1.07	-	[1.04-1.09]	LINC02468,TCP2	Myocardial infarction	myocardial infarction	-	GCST011364	12:20067099	33532862	Hartiala JA
rs376993806-C	2.00E-08	-	0.716864	1.07	-	[1.05-1.10]	GP5M1	Myocardial infarction	myocardial infarction	-	GCST011364	9:136352136	33532862	Hartiala JA
rs12983897-G	2.00E-08	-	0.481922	1.06	-	[1.04-1.09]	FCHO1	Myocardial infarction	myocardial infarction	-	GCST011364	19:17747755	33532862	Hartiala JA
rs433903-G	2.00E-08	-	0.837766	1.06	-	[1.04-1.09]	DHX36,ARHGEF2	Myocardial infarction	myocardial infarction	-	GCST011365	3:154262341	33532862	Hartiala JA
rs28429551-A	2.00E-08	-	0.757751	1.06	-	[1.04-1.08]	GP5M1	Myocardial infarction	myocardial infarction	-	GCST011365	9:136348882	33532862	Hartiala JA

rs9945890-T	2.00E-08	-	0.631427	1.05	-	[1.03-1.06]	DYM-AS1,SMAD1	Myocardial infarction	myocardial infarction	-	GCST011365	18:48989546	33532862	Hartiala JA
rs6102343-A	2.00E-08	-	0.24257	1.05	-	[1.03-1.07]	ZHX3	Myocardial infarction	myocardial infarction	-	GCST011365	20:41295639	33532862	Hartiala JA
rs2161967-T	2.00E-08	-	0.463355	1.04	-	[1.03-1.06]	TNS1	Myocardial infarction	myocardial infarction	-	GCST011365	2:217815806	33532862	Hartiala JA
rs2972149-A	2.00E-08	-	0.47944	1.04	-	[1.03-1.06]	NYAP2,MIR5702	Myocardial infarction	myocardial infarction	-	GCST011365	2:22627434	33532862	Hartiala JA
rs7485656-G	3.00E-08	-	0.151356	1.09	-	[1.06-1.12]	SCARB1	Myocardial infarction	myocardial infarction	-	GCST011364	12:124831101	33532862	Hartiala JA
rs1964600-A	3.00E-08	-	0.247629	1.07	-	[1.05-1.10]	FAM99A,KRTAP	Myocardial infarction	myocardial infarction	-	GCST011364	11:1659434	33532862	Hartiala JA
rs34633566-C	3.00E-08	-	0.345721	1.04	-	[1.03-1.06]	RSPHA	Myocardial infarction	myocardial infarction	-	GCST011365	19:45803461	33532862	Hartiala JA
rs6761276-T	3.00E-08	-	0.432632	1.04	-	[1.03-1.06]	IL1F10	Myocardial infarction	myocardial infarction	-	GCST011365	2:113074735	33532862	Hartiala JA
rs7137258-A	4.00E-08	-	0.061975	1.13	-	[1.08-1.19]	FAM242C,FLJ128	Myocardial infarction	myocardial infarction	-	GCST011364	12:54118380	33532862	Hartiala JA
rs113716316-C	4.00E-08	-	0.934458	1.09	-	[1.06-1.13]	AHDC1	Myocardial infarction	myocardial infarction	-	GCST011365	1:27602129	33532862	Hartiala JA
rs8037798-A	4.00E-08	-	0.233044	1.05	-	[1.03-1.07]	RPP25,COX5A	Myocardial infarction	myocardial infarction	-	GCST011365	15:74947689	33532862	Hartiala JA
rs7025486-A	4.00E-08	-	0.259586	1.05	-	[1.03-1.07]	DAB2IP	Myocardial infarction	myocardial infarction	-	GCST011365	9:121660124	33532862	Hartiala JA
rs2820309-G	4.00E-08	-	0.320548	1.04	-	[1.03-1.06]	IP09	Myocardial infarction	myocardial infarction	-	GCST011365	1:201865816	33532862	Hartiala JA
rs9591012-G	4.00E-08	-	0.663083	1.04	-	[1.03-1.06]	N4BP2L2	Myocardial infarction	myocardial infarction	-	GCST011365	13:32484196	33532862	Hartiala JA
rs748431-G	4.00E-08	-	0.398231	1.04	-	[1.03-1.06]	PGD5	Myocardial infarction	myocardial infarction	-	GCST011365	3:14886570	33532862	Hartiala JA

Supplementary Table 2: Genome-wide significant SNPs associated with MI in European cohorts and their characteristics

riskAllele	pValue	pValueAnnotation	riskFrequency	orValue	beta	ci	mappedGenes	traitName	efoTraits	bgTraits	accessionId	locations	pubmedId	author
rs4977574-?	5.00E-128		NR	0.8381	-	-	CDKN2B-AS1	Myocardial infarction	myocardial infarction	-	GCST90432175	9:22098575	38072966	Al-Ali AK
rs10455872-?	1.00E-81		NR	0.7339	-	-	LPA	Myocardial infarction	myocardial infarction	-	GCST90432175	6:160589086	38072966	Al-Ali AK
rs1479299386	1.00E-62		NR	0.88	-	-	CDKN2B-AS1	Myocardial infarction	myocardial infarction	-	GCST90432175	9:21997874	38072966	Al-Ali AK
rs4252188-?	7.00E-38		NR	0.7804	-	-	PLG	Myocardial infarction	myocardial infarction	-	GCST90432175	6:160702419	38072966	Al-Ali AK
rs9349379-?	2.00E-55		NR	0.8885	-	-	PHACTR1	Myocardial infarction	myocardial infarction	-	GCST90432175	6:12903725	38072966	Al-Ali AK
rs12740374-?	6.00E-30		NR	11,073	-	-	CELSR2	Myocardial infarction	myocardial infarction	-	GCST90432175	1:109274968	38072966	Al-Ali AK
rs35700460-?	3.00E-23		NR	0.9204	-	-	MIA3	Myocardial infarction	myocardial infarction	-	GCST90432175	1:222638065	38072966	Al-Ali AK
rs10774625-?	5.00E-23		NR	10,816	-	-	ATXN2	Myocardial infarction	myocardial infarction	-	GCST90432175	12:111472415	38072966	Al-Ali AK
rs9381401-?	5.00E-23		NR	0.9293	-	-	PHACTR1	Myocardial infarction	myocardial infarction	-	GCST90432175	6:12801735	38072966	Al-Ali AK
rs74625856-?	1.00E-22		NR	0.8057	-	-	MAP3K4-AS1,PLG	Myocardial infarction	myocardial infarction	-	GCST90432175	6:160892587	38072966	Al-Ali AK
rs1412445-?	4.00E-20		NR	0.9312	-	-	LIPA	Myocardial infarction	myocardial infarction	-	GCST90432175	10:89243047	38072966	Al-Ali AK
rs72926767-?	7.00E-20		NR	0.8998	-	-	CARF,WDR12	Myocardial infarction	myocardial infarction	-	GCST90432175	2:202932091	38072966	Al-Ali AK
rs140168762-?	1.00E-19		NR	0.9002	-	-	NBEAL1	Myocardial infarction	myocardial infarction	-	GCST90432175	2:203033223	38072966	Al-Ali AK
rs28451064-?	1.00E-19		NR	0.8972	-	-	MRP6,KCNE2,LINC00310	Myocardial infarction	myocardial infarction	-	GCST90432175	21:34221526	38072966	Al-Ali AK
rs2019090-?	2.00E-19		NR	10,745	-	-	PDGFDDN	Myocardial infarction	myocardial infarction	-	GCST90432175	11:103798234	38072966	Al-Ali AK
rs143805266-?	2.00E-19		NR	0.9009	-	-	ICA1L	Myocardial infarction	myocardial infarction	-	GCST90432175	2:202829191	38072966	Al-Ali AK
rs72934591-?	3.00E-19		NR	0.9014	-	-	NBEAL1	Myocardial infarction	myocardial infarction	-	GCST90432175	2:203155039	38072966	Al-Ali AK
rs2519093-?	4.00E-19		NR	0.9186	-	-	ABO	Myocardial infarction	myocardial infarction	-	GCST90432175	9:133266456	38072966	Al-Ali AK
rs2327426-?	6.00E-19		NR	10,726	-	-	TARID	Myocardial infarction	myocardial infarction	-	GCST90432175	6:133881552	38072966	Al-Ali AK
rs11065979-?	3.00E-18		NR	932	-	-	ATXN2-AS	Myocardial infarction	myocardial infarction	-	GCST90432175	12:111621753	38072966	Al-Ali AK
rs144078421-?	3.00E-18		NR	0.7414	-	-	IGF2R,IRN	Myocardial infarction	myocardial infarction	-	GCST90432175	6:160003858	38072966	Al-Ali AK
rs17696736-?	7.00E-18		NR	0.9338	-	-	NAA25	Myocardial infarction	myocardial infarction	-	GCST90432175	12:112049014	38072966	Al-Ali AK
rs7769879-?	7.00E-18		NR	0.9363	-	-	SLC22A3	Myocardial infarction	myocardial infarction	-	GCST90432175	6:160444613	38072966	Al-Ali AK
rs9456508-?	2.00E-17		NR	852	-	-	SLC22A2	Myocardial infarction	myocardial infarction	-	GCST90432175	6:160177564	38072966	Al-Ali AK
rs28521319-?	2.00E-17		NR	0.9323	-	-	DISP1,FAM177B	Myocardial infarction	myocardial infarction	-	GCST90432175	1:222762689	38072966	Al-Ali AK
rs72938351-?	6.00E-17		NR	0.8991	-	-	CYP20A1	Myocardial infarction	myocardial infarction	-	GCST90432175	2:203286780	38072966	Al-Ali AK
rs10176176-?	7.00E-17		NR	0.9405	-	-	PARTICL	Myocardial infarction	myocardial infarction	-	GCST90432175	2:85534925	38072966	Al-Ali AK
rs9457761-?	8.00E-17		NR	0.7509	-	-	PNLDC1,MAS1	Myocardial infarction	myocardial infarction	-	GCST90432175	6:159871571	38072966	Al-Ali AK
rs7173743-?	1.00E-16		NR	10,632	-	-	MORF4L1	Myocardial infarction	myocardial infarction	-	GCST90432175	15:78849442	38072966	Al-Ali AK
rs11066188-?	2.00E-16		NR	0.9352	-	-	HECTD4	Myocardial infarction	myocardial infarction	-	GCST90432175	12:112172910	38072966	Al-Ali AK
NA-?	2.00E-16		NR	13,379	-	-	-	Myocardial infarction	myocardial infarction	-	GCST90432175	-	38072966	Al-Ali AK
rs11513729-?	3.00E-16		NR	935	-	-	MAPKAPK5-AS1,ALDH2	Myocardial infarction	myocardial infarction	-	GCST90432175	12:111835695	38072966	Al-Ali AK
rs112374548-?	6.00E-16		NR	11,043	-	-	SMARCA4	Myocardial infarction	myocardial infarction	-	GCST90432175	19:11078223	38072966	Al-Ali AK
rs589655-?	1.00E-15		NR	10,936	-	-	LINC00841,LINC03089	Myocardial infarction	myocardial infarction	-	GCST90432175	10:44249867	38072966	Al-Ali AK
rs11066320-?	1.00E-15		NR	10,673	-	-	PTPN11	Myocardial infarction	myocardial infarction	-	GCST90432175	12:112468611	38072966	Al-Ali AK
rs55754459-?	1.00E-15		NR	0.8288	-	-	AGPAT4	Myocardial infarction	myocardial infarction	-	GCST90432175	6:161130144	38072966	Al-Ali AK
rs41290120-?	3.00E-15		NR	1,168	-	-	NECTN2	Myocardial infarction	myocardial infarction	-	GCST90432175	19:44879418	38072966	Al-Ali AK
rs3782886-A	1.00E-14		0.26	1.46	-	[1.33-1.60]	BRAP	Myocardial infarction	myocardial infarction	-	GCST002475	12:111672685	24916648	Hirokawa M
rs1870635-?	1.00E-14		NR	0.9424	-	-	LINC00841,LINC03089	Myocardial infarction	myocardial infarction	-	GCST90432175	10:43985246	38072966	Al-Ali AK
rs1237851118	2.00E-14		NR	0.94	-	-	CUX2	Myocardial infarction	myocardial infarction	-	GCST90432175	12:111270655	38072966	Al-Ali AK
rs9970807-?	2.00E-14		NR	11,033	-	-	PLPP3	Myocardial infarction	myocardial infarction	-	GCST90432175	1:56499992	38072966	Al-Ali AK
rs3125060-?	5.00E-14		NR	924	-	-	SLC22A2,SLC22A3	Myocardial infarction	myocardial infarction	-	GCST90432175	6:160289986	38072966	Al-Ali AK
rs11556924-?	5.00E-14		NR	10,643	-	-	ZC3HC1,UBE2H-DT	Myocardial infarction	myocardial infarction	-	GCST90432175	7:130023656	38072966	Al-Ali AK
rs56336142-?	5.00E-14		NR	10,723	-	-	KCNK5,SAYS1	Myocardial infarction	myocardial infarction	-	GCST90432175	6:39166323	38072966	Al-Ali AK
rs11617955-?	1.00E-13		NR	10,958	-	-	COL4A1	Myocardial infarction	myocardial infarction	-	GCST90432175	13:110165755	38072966	Al-Ali AK
rs9982601-T	2.00E-13		0.16	1.38	-	[NR]	KCNE2,LINC00310,MRP6	Myocardial infarction	myocardial infarction	-	GCST003471	21:34226827	26708285	Wakil SM
rs3918226-?	2.00E-13		NR	891	-	-	NO3	Myocardial infarction	myocardial infarction	-	GCST90432175	7:150993088	38072966	Al-Ali AK
rs9515203-?	4.00E-13		NR	10,661	-	-	COL4A2	Myocardial infarction	myocardial infarction	-	GCST90432175	13:110397276	38072966	Al-Ali AK
rs11748327-?	5.00E-13		NR	1.25	-	[1.18-1.33]	LINC02063,IRX1	Myocardial infarction	myocardial infarction	-	GCST000887	5:4029676	21107343	Aoki A
rs10738607-G	7.00E-13		0.63	12,658,228	-	[NR]	CDKN2B-AS1	Myocardial infarction	myocardial infarction	-	GCST003471	9:22088095	26708285	Wakil SM
rs72689147-?	2.00E-12		NR	10,682	-	-	GUCY1A1	Myocardial infarction	myocardial infarction	-	GCST90432175	4:155718736	38072966	Al-Ali AK
rs2681472-?	5.00E-12		NR	0.9384	-	-	ATP2B1	Myocardial infarction	myocardial infarction	-	GCST90432175	12:89615182	38072966	Al-Ali AK
rs41411047-A	1.00E-11		0.09	1.51	-	[NR]	ANKUB1,RNF13	Myocardial infarction	myocardial infarction	-	GCST003471	3:149875124	26708285	Wakil SM
rs2954021-?	2.00E-11		NR	10,503	-	-	TRB1AL	Myocardial infarction	myocardial infarction	-	GCST90432175	8:125469835	38072966	Al-Ali AK
rs1169288-?	2.00E-11		NR	0.9481	-	-								

rs7011846-?	6.00E-11	-	NR	0.8647	-	-	LPL	Myocardial infarction	myocardial infarction	-	GCST90432175	8.19928145	38072966	Al-Ali AK
rs11523031-?	7.00E-11	-	NR	10,504	-	-	MTAP	Myocardial infarction	myocardial infarction	-	GCST90432175	9:21843843	38072966	Al-Ali AK
rs73078367-?	8.00E-11	-	NR	10,814	-	-	LINC02585	Myocardial infarction	myocardial infarction	-	GCST90432175	3:48670914	38072966	Al-Ali AK
rs11099493-?	8.00E-11	-	NR	10,542	-	-	RASGEF1B	Myocardial infarction	myocardial infarction	-	GCST90432175	4:81665896	38072966	Al-Ali AK
rs7137258-?	9.00E-11	-	NR	903	-	-	FAM242C,FLJ12825	Myocardial infarction	myocardial infarction	-	GCST90432175	12:54118380	38072966	Al-Ali AK
rs2624691-?	1.00E-10	-	NR	10,486	-	-	LINC00841,LINC03089	Myocardial infarction	myocardial infarction	-	GCST90432175	10:44092409	38072966	Al-Ali AK
rs9865841-?	1.00E-10	-	NR	0.9446	-	-	MSL2	Myocardial infarction	myocardial infarction	-	GCST90432175	3:136157283	38072966	Al-Ali AK
rs10841443-?	2.00E-10	-	NR	0.9509	-	-	LINC02468,TCP1P3	Myocardial infarction	myocardial infarction	-	GCST90432175	12:20067099	38072966	Al-Ali AK
rs72743461-?	2.00E-10	-	NR	10,595	-	-	SMAD3	Myocardial infarction	myocardial infarction	-	GCST90432175	15:67149412	38072966	Al-Ali AK
rs13416670-?	2.00E-10	-	NR	0.9463	-	-	RAPH1,ABI2	Myocardial infarction	myocardial infarction	-	GCST90432175	2:203421051	38072966	Al-Ali AK
rs32793-G	3.00E-10	-	0.28	1.25	-	[NR]	PDZD2	Myocardial infarction	myocardial infarction	-	GCST003471	5:32073460	26708285	Wakil SM
rs76722925-?	3.00E-10	-	NR	10,945	-	-	RPL30P9,LPL	Myocardial infarction	myocardial infarction	-	GCST90432175	8:20073987	38072966	Al-Ali AK
rs35586793-?	3.00E-10	-	NR	10,589	-	-	TBXAS1,PARP12	Myocardial infarction	myocardial infarction	-	GCST90432175	7:140022730	38072966	Al-Ali AK
rs16986953-?	3.00E-10	-	NR	0.9222	-	-	LINC01808,CISD1P1	Myocardial infarction	myocardial infarction	-	GCST90432175	2:19742712	38072966	Al-Ali AK
chr1.19295119	3.00E-10	-	NR	0.5742	-	-	-	Myocardial infarction	myocardial infarction	-	GCST90432174	-	38072966	Al-Ali AK
rs2760740-?	3.00E-10	-	NR	0.9515	-	-	SMG6	Myocardial infarction	myocardial infarction	-	GCST90432175	17:2117695	38072966	Al-Ali AK
rs6686750-?	4.00E-10	-	NR	10,473	-	-	IL6R	Myocardial infarction	myocardial infarction	-	GCST90432175	1:154447367	38072966	Al-Ali AK
rs2279241-?	4.00E-10	-	NR	0.9367	-	-	MRA5	Myocardial infarction	myocardial infarction	-	GCST90432175	3:138402356	38072966	Al-Ali AK
rs12203224-?	7.00E-10	-	NR	10,489	-	-	TARD1	Myocardial infarction	myocardial infarction	-	GCST90432175	6:133780356	38072966	Al-Ali AK
rs11810571-?	7.00E-10	-	NR	0.9431	-	-	TLRKH	Myocardial infarction	myocardial infarction	-	GCST90432175	1:151789832	38072966	Al-Ali AK
rs6689306-?	7.00E-10	-	NR	10,473	-	-	IDR6	Myocardial infarction	myocardial infarction	-	GCST90432175	1:154423470	38072966	Al-Ali AK
rs10305839-?	9.00E-10	-	NR	0.9403	-	-	PRMT5P1,EDNRA	Myocardial infarction	myocardial infarction	-	GCST90432175	4:147479261	38072966	Al-Ali AK
rs61789642-?	9.00E-10	-	NR	10,747	-	-	STAG1	Myocardial infarction	myocardial infarction	-	GCST90432175	3:136390854	38072966	Al-Ali AK
rs1967604-?	1.00E-09	-	NR	10,521	-	-	RNU6-1064P,RNU6-996P	Myocardial infarction	myocardial infarction	-	GCST90432175	9:107768043	38072966	Al-Ali AK
rs17628203-?	1.00E-09	-	NR	0.8655	-	-	AGPAT4	Myocardial infarction	myocardial infarction	-	GCST90432175	6:161261537	38072966	Al-Ali AK
rs78807522-?	1.00E-09	-	NR	10,782	-	-	DALRD3	Myocardial infarction	myocardial infarction	-	GCST90432175	3:49018717	38072966	Al-Ali AK
rs34290943-?	1.00E-09	-	NR	10,769	-	-	LAMB2	Myocardial infarction	myocardial infarction	-	GCST90432175	3:49124227	38072966	Al-Ali AK
rs6414337-?	1.00E-09	-	NR	0.9471	-	-	NCK1	Myocardial infarction	myocardial infarction	-	GCST90432175	3:136913695	38072966	Al-Ali AK
rs2505083-?	2.00E-09	-	NR	956	-	-	JCAD	Myocardial infarction	myocardial infarction	-	GCST90432175	10:30046193	38072966	Al-Ali AK
rs10858890-?	2.00E-09	-	NR	0.9502	-	-	POC1B	Myocardial infarction	myocardial infarction	-	GCST90432175	12:89513389	38072966	Al-Ali AK
rs10857147-?	2.00E-09	-	NR	0.9509	-	-	FGF5,PRDM8	Myocardial infarction	myocardial infarction	-	GCST90432175	4:80259918	38072966	Al-Ali AK
rs73079003-?	2.00E-09	-	NR	10,749	-	-	CDHR4	Myocardial infarction	myocardial infarction	-	GCST90432175	3:49795355	38072966	Al-Ali AK
rs3772800-?	2.00E-09	-	NR	0.9425	-	-	KALRN	Myocardial infarction	myocardial infarction	-	GCST90432175	3:124719739	38072966	Al-Ali AK
rs4618210-G	3.00E-09	-	0.44	1.1	-	[1.06-1.14]	PLCL2	Myocardial infarction	myocardial infarction	-	GCST002475	3:17082892	24916648	Hirokawa M
rs73078305-?	3.00E-09	-	NR	10,777	-	-	PFKFB4	Myocardial infarction	myocardial infarction	-	GCST90432175	3:48547380	38072966	Al-Ali AK
rs111533129-?	3.00E-09	-	NR	10,685	-	-	RHOA	Myocardial infarction	myocardial infarction	-	GCST90432175	3:49400167	38072966	Al-Ali AK
rs143311886-?	3.00E-09	-	NR	10,698	-	-	BSN	Myocardial infarction	myocardial infarction	-	GCST90432175	3:49583934	38072966	Al-Ali AK
rs2452009-?	3.00E-09	-	NR	10,492	-	-	PDLIM5	Myocardial infarction	myocardial infarction	-	GCST90432175	4:94574757	38072966	Al-Ali AK
rs9896535-?	3.00E-09	-	NR	0.9561	-	-	SMG6	Myocardial infarction	myocardial infarction	-	GCST90432175	17:2229911	38072966	Al-Ali AK
rs11652894-?	3.00E-09	-	NR	10,473	-	-	GID4	Myocardial infarction	myocardial infarction	-	GCST90432175	17:18049125	38072966	Al-Ali AK
rs3803915-C	4.00E-09	-	0.19	1.12	-	[1.09-1.16]	AP3D1	Myocardial infarction	myocardial infarction	-	GCST002475	19:2160530	24916648	Hirokawa M
rs62389460-?	5.00E-09	-	NR	10,727	-	-	PHACTR1	Myocardial infarction	myocardial infarction	-	GCST90432175	6:13098070	38072966	Al-Ali AK
rs12693302-?	5.00E-09	-	NR	10,452	-	-	PDE1A	Myocardial infarction	myocardial infarction	-	GCST90432175	2:182346716	38072966	Al-Ali AK
rs13075615-?	6.00E-09	-	NR	10,656	-	-	STAG1-DT	Myocardial infarction	myocardial infarction	-	GCST90432175	3:136786990	38072966	Al-Ali AK
rs13402621-?	6.00E-09	-	NR	0.9494	-	-	LINC01126,THADA	Myocardial infarction	myocardial infarction	-	GCST90432175	2:43231472	38072966	Al-Ali AK
rs4739066-A	7.00E-09	-	0.86	1,369,863	-	[NR]	YTHDF3	Myocardial infarction	myocardial infarction	-	GCST003471	8:63191534	26708285	Wakil SM
rs17115100-?	7.00E-09	-	NR	10,694	-	-	CYP17A1,WBP1L	Myocardial infarction	myocardial infarction	-	GCST90432175	10:102831636	38072966	Al-Ali AK
rs9486719-?	7.00E-09	-	NR	1,054	-	-	FHL5	Myocardial infarction	myocardial infarction	-	GCST90432175	6:96612248	38072966	Al-Ali AK
rs35849216-?	7.00E-09	-	NR	10,713	-	-	STAG1	Myocardial infarction	myocardial infarction	-	GCST90432175	3:136608727	38072966	Al-Ali AK
rs7145262-?	8.00E-09	-	NR	957	-	-	HHIP1L	Myocardial infarction	myocardial infarction	-	GCST90432175	14:99659384	38072966	Al-Ali AK
rs62076439-?	8.00E-09	-	NR	0.9554	-	-	ZNF652	Myocardial infarction	myocardial infarction	-	GCST90432175	17:49327266	38072966	Al-Ali AK
rs7501812-?	8.00E-09	-	NR	10,457	-	-	TOM1L2	Myocardial infarction	myocardial infarction	-	GCST90432175	17:17847593	38072966	Al-Ali AK
rs11191515-?	1.00E-08	-	NR	10,726	-	-	CNNM2	Myocardial infarction	myocardial infarction	-	GCST90432175	10:103016770	38072966	Al-Ali AK
rs79780963-?	1.00E-08	-	NR	10,724	-	-	NT5C2	Myocardial infarction	myocardial infarction	-	GCST90432175	10:103192742	38072966	Al-Ali AK
rs3094680-?	1.00E-08	-	NR	0.9557	-	-	USP8P1	Myocardial infarction	myocardial infarction	-	GCST90432175	6:31276118	38072966	Al-Ali AK
rs2972149-?	1.00E-08	-	NR	959	-	-	NYAP2,MIR5702	Myocardial infarction	myocardial infarction	-	GCST90432175	2:226227434	38072966	Al-Ali AK
rs4593108-?	1.00E-08	-	NR	10,546	-	-	MIR548G,RPL31P26	Myocardial infarction	myocardial infarction	-	GCST90432175	4:147359849	38072966	Al-Ali AK
rs12637102-?	1.00E-08	-	NR	0.9517	-	-	STAG1	Myocardial infarction	myocardial infarction	-	GCST90432175	3:136493118	38072966	Al-Ali AK
rs789294-?	1.00E-08	-	NR	0.9401	-	-	GPR149	Myocardial infarction	myocardial infarction	-	GCST90432175	3:154339952	38072966	Al-Ali AK
rs16880442-G	2.00E-08	-	0.93	14,084,507	-	[NR]	B3GNTL1P1,ITGA1	Myocardial infarction	myocardial infarction	-	GCST003471	5:52889863	26708285	Wakil SM
rs11057837-?	2.00E-08	-	NR	0.9307	-	-	SCARB1	Myocardial infarction	myocardial infarction	-	GCST90432175	12:124827174	38072966	Al-Ali AK
rs11619113-?	2.00E-08	-	NR	0.9377	-	-	COL4A1	Myocardial infarction	myocardial infarction	-	GCST90432175	13:110266313	38072966	Al-Ali AK
rs12743267-?	2.00E-08	-	NR	10,497	-	-	SLC44A3-AS1	Myocardial infarction	myocardial infarction	-	GCST90432175	1:94783750	38072966	Al-Ali AK
rs4678428-?	2.00E-08	-	NR	0.9525	-	-	PCCB	Myocardial infarction	myocardial infarction	-	GCST90432175	3:136269570	38072966	Al-Ali AK
chr9.30618549	2.00E-08	-	NR	4,831	-	-	-	Myocardial infarction	myocardial infarction	-	GCST90432174	-	38072966	Al-Ali AK
rs4643373-?	2.00E-08	-	NR	1,048	-	-	IGF2BP1	Myocardial infarction	myocardial infarction	-	GCST90432175	17:49046061	38072966	Al-Ali AK
rs1904920-?	2.00E-08	-	NR	10,505	-	-	GOLGA6P,ADAMT87	Myocardial infarction	myocardial infarction	-	GCST90432175	15:78737245	38072966	Al-Ali AK
rs259979-?	2.00E-08	-	NR	0.9421	-	-	ZNF831	Myocardial infarction	myocardial infarction	-	GCST90432175	20:59175501	38072966	Al-Ali AK
rs9591012-?	3.00E-08	-	NR	10,448	-	-	N4BP2L2	Myocardial infarction	myocardial infarction	-	GCST90432175	13:32484196	38072966	Al-Ali AK
rs2764203-?	3.00E-08	-	NR	0.9425	-	-	ATP6V1FP1,RPS10P13	Myocardial infarction	myocardial infarction	-	GCST90432175	6:34741124	38072966	Al-Ali AK
rs2983896-?	3.00E-08	-	NR	10,503	-	-	FHL5	Myocardial infarction	myocardial infarction	-	GCST90432175	6:96581995	38072966	Al-Ali AK
rs357504-?	3.00E-08	-	NR	0.94	-	-	ARHGEF26	Myocardial infarction	myocardial infarction	-	GCST90432175	3		

chr11:9748739	3.00E-08	-	NR	13,286	-	-	-	Myocardial infarction	myocardial infarction	-	GCST90432174	-	38072966	AI-Ali AK
rs8080108-?	3.00E-08	-	NR	0.9544	-	-	ZNF652-AS1	Myocardial infarction	myocardial infarction	-	GCST90432175	17:49436349	38072966	AI-Ali AK
rs34633566-?	3.00E-08	-	NR	0.9579	-	-	RSPH6A	Myocardial infarction	myocardial infarction	-	GCST90432175	19:45803461	38072966	AI-Ali AK
rs6102343-?	3.00E-08	-	NR	0.9541	-	-	ZHX3	Myocardial infarction	myocardial infarction	-	GCST90432175	20:41295639	38072966	AI-Ali AK
rs10895508-?	4.00E-08	-	NR	0.9541	-	-	PDGFDDN	Myocardial infarction	myocardial infarction	-	GCST90432175	11:103676552	38072966	AI-Ali AK
rs16894959-?	4.00E-08	-	NR	0.9425	-	-	BLTP3A	Myocardial infarction	myocardial infarction	-	GCST90432175	6:34857885	38072966	AI-Ali AK
rs6761276-?	4.00E-08	-	NR	10,422	-	-	IL1F10	Myocardial infarction	myocardial infarction	-	GCST90432175	2:113074735	38072966	AI-Ali AK
rs72928925-?	4.00E-08	-	NR	0.9455	-	-	FAM117B	Myocardial infarction	myocardial infarction	-	GCST90432175	2:202689601	38072966	AI-Ali AK
chr1:16425220	4.00E-08	-	NR	0.5056	-	-	-	Myocardial infarction	myocardial infarction	-	GCST90432174	-	38072966	AI-Ali AK
chr9:22121349	4.00E-08	-	NR	12,983	-	-	-	Myocardial infarction	myocardial infarction	-	GCST90432174	-	38072966	AI-Ali AK
rs7214002-?	4.00E-08	-	NR	959	-	-	TOM1L2	Myocardial infarction	myocardial infarction	-	GCST90432175	17:17948790	38072966	AI-Ali AK
rs57636940-?	4.00E-08	-	NR	11,303	-	-	SPECC1L,SPECC1L-ADORA	Myocardial infarction	myocardial infarction	-	GCST90432175	22:24283939	38072966	AI-Ali AK
rs61908736-?	5.00E-08	-	NR	0.9539	-	-	PPIAP43,ARHGAP42-AS1	Myocardial infarction	myocardial infarction	-	GCST90432175	11:100677971	38072966	AI-Ali AK
rs2107595-?	5.00E-08	-	NR	0.9499	-	-	TWIST1,HDAC9	Myocardial infarction	myocardial infarction	-	GCST90432175	7:19009765	38072966	AI-Ali AK
rs3128759-?	5.00E-08	-	NR	0.9568	-	-	C2	Myocardial infarction	myocardial infarction	-	GCST90432175	6:31918153	38072966	AI-Ali AK
rs2161967-?	5.00E-08	-	NR	1,042	-	-	TNS1	Myocardial infarction	myocardial infarction	-	GCST90432175	2:217815806	38072966	AI-Ali AK
rs928758-?	5.00E-08	-	NR	10,434	-	-	MRP86,KCNE2	Myocardial infarction	myocardial infarction	-	GCST90432175	21:34326877	38072966	AI-Ali AK

Supplementary Table 3: Genome-wide significant SNPs associated with MI in non-European cohorts and their characteristics



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